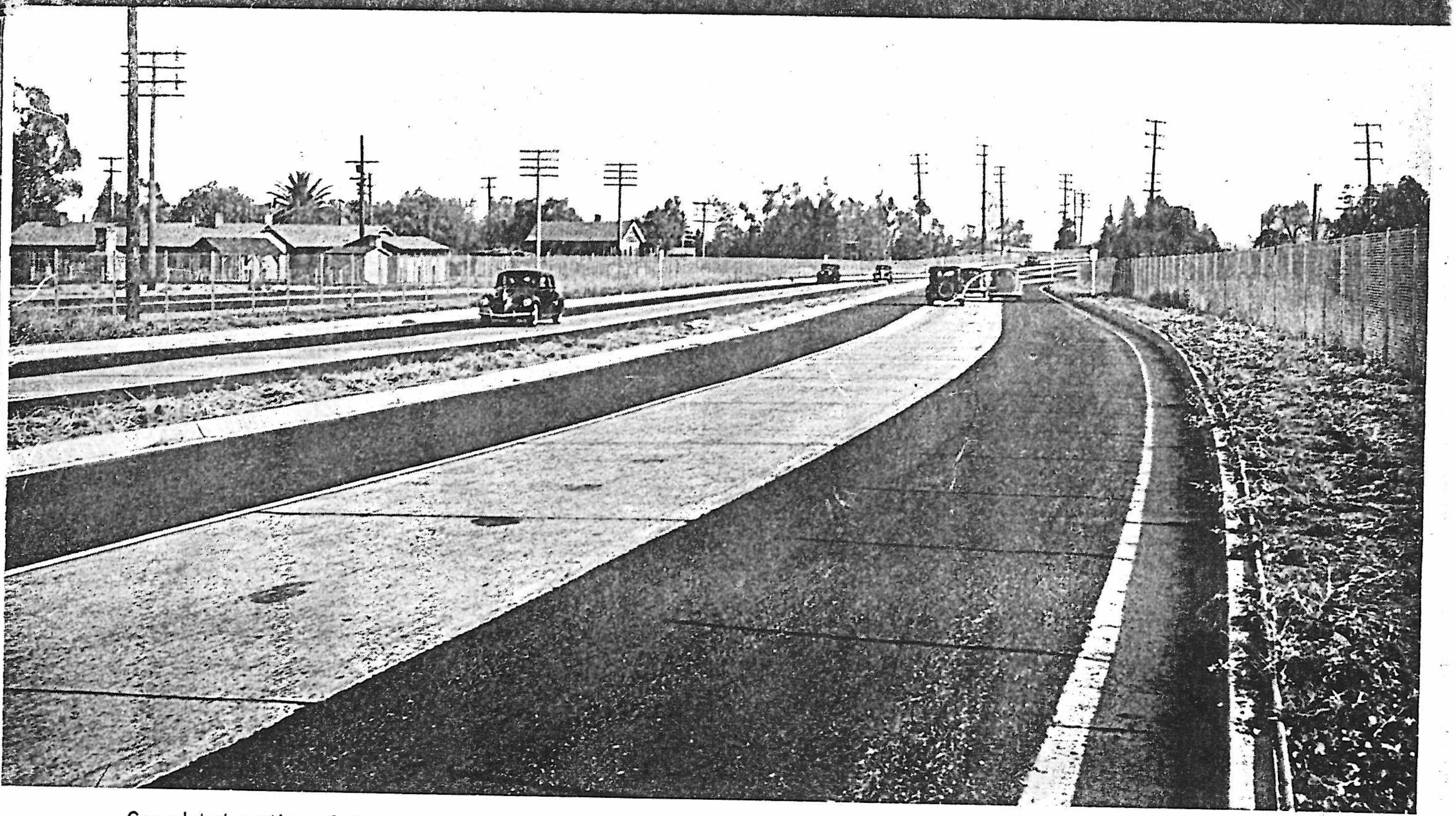


Completed section of Arroyo Seco Parkway beginning at Glenarm Street in Pasadena. Designed as a "freeway" it has six lanes divided by a raised separation strip and no stop lights or intersections in its nine-mile length between Pasadena and Los Angeles.

Arroyo Seco 6-Lane Freeway

By S. V. CORTELYOU, District Engineer

With four contracts completed and three contracts now under way, the Arroyo Seco Parkway, which is to connect downtown Los Angeles with Pasadena and other points to the north and east, is well on its way toward realization. The distance from the business district of Pasadena to downtown Los Angeles via this new route will be nine miles, about six miles of which will be new construction by the State.

Designed as a "Freeway," this highway will enable traffic to pass from the Figueroa Street tunnels in Los Angeles to Broadway and Glenarm Street in Pasadena without encountering a single stop light, intersecting street or railroad grade crossing.

Three wide traffic lanes will be provided for traffic in each direction, separated in the center by a raised dividing strip which will make it impossible to make left turns across traffic or to meet opposing traffic "head on."

Access to the "Parkway" will be had at intervals by means of modified "clover leaf" intersections on which only right hand turns from the "Parkway" may be made. Each of these intersections is being carefully designed to conform to its particular topographic features and traffic requirements.

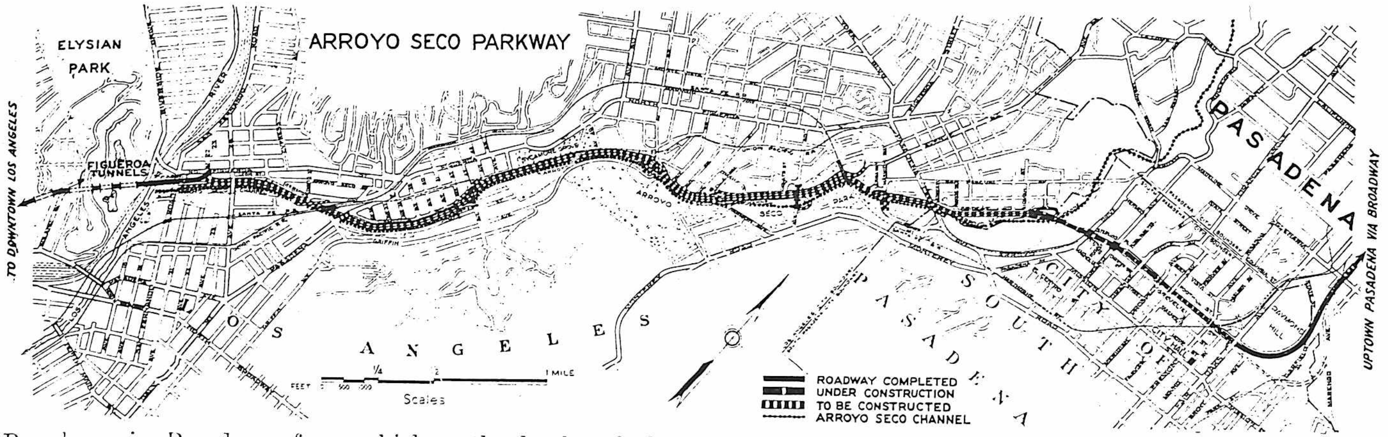
SERVICE ROADS PROVIDED

Adjoining privately owned property will not have direct access to the "Parkway" but will front on service roads paralleling the highway. These service roads will connect with the "Parkway" at suitable intervals by means of one way ramps.

Accelerating and decelerating lanes will be provided at each of these ramps to permit entering traffic to "speed up" to the legal speed of traffic on the "Parkway" before entering one of the main traffic lanes and to permit traffic leaving the "Parkway" to "slow down" on an additional traffic lane before turning off of the main highway. These safety provisions are in accordance with accepted "Freeway" design and will result in a minimum of interference with "Parkway" traffic.

The "Parkway" between Hough Street and Avenue 26 in Los Angeles, will follow the northwesterly side of the Arroyo Seco Channel, being depressed to permit all intersecting streets and railroads to cross on overhead bridges. Near Hough Street, in Los Angeles, the alignment enters the city of South Pasadena, crossing the Arroyo Seco Channel on a bridge which is now under construction.

Thence the "Parkway" runs easterly along Sterling Place and Grevelia Street on a depressed grade which will be about 20 feet below natural ground elevation from Arroyo Drive to Fair Oaks Avenue. Just easterly of Fair Oaks Avenue the grade ascends to approximate ground level curving northerly around Raymond Hill and entering the city of Pasadena on Broadway. Actual construction work by the State ends at the intersection of Glenarm Street and



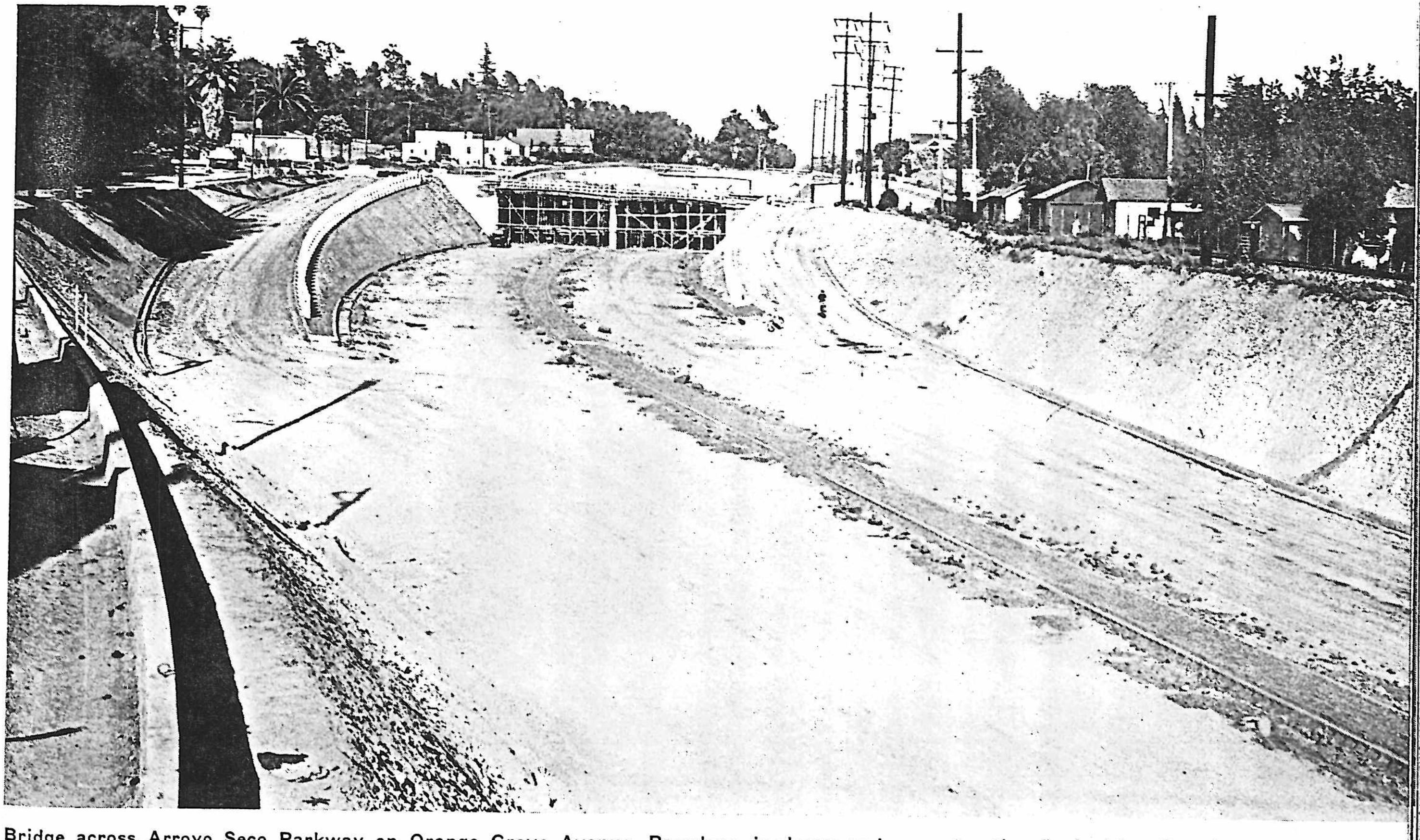
Broadway in Pasadena, from which point connection is made with the business district of Pasadena via Broadway, which is already a wide, improved street.

The Arroyo Seco Parkway in Los Angeles from Avenue 22 to Hough Street near the south city limit of South Pasadena is located for the greater part of the distance adjoining and parallel to the Arroyo Seco Channel, which is paved and walled for the entire distance. The grade of the highway can thus be established at critical points somewhat lower than the banks of the channel to permit crossings of intersecting streets and railroads to be made on overhead bridges at a minimum of expense.

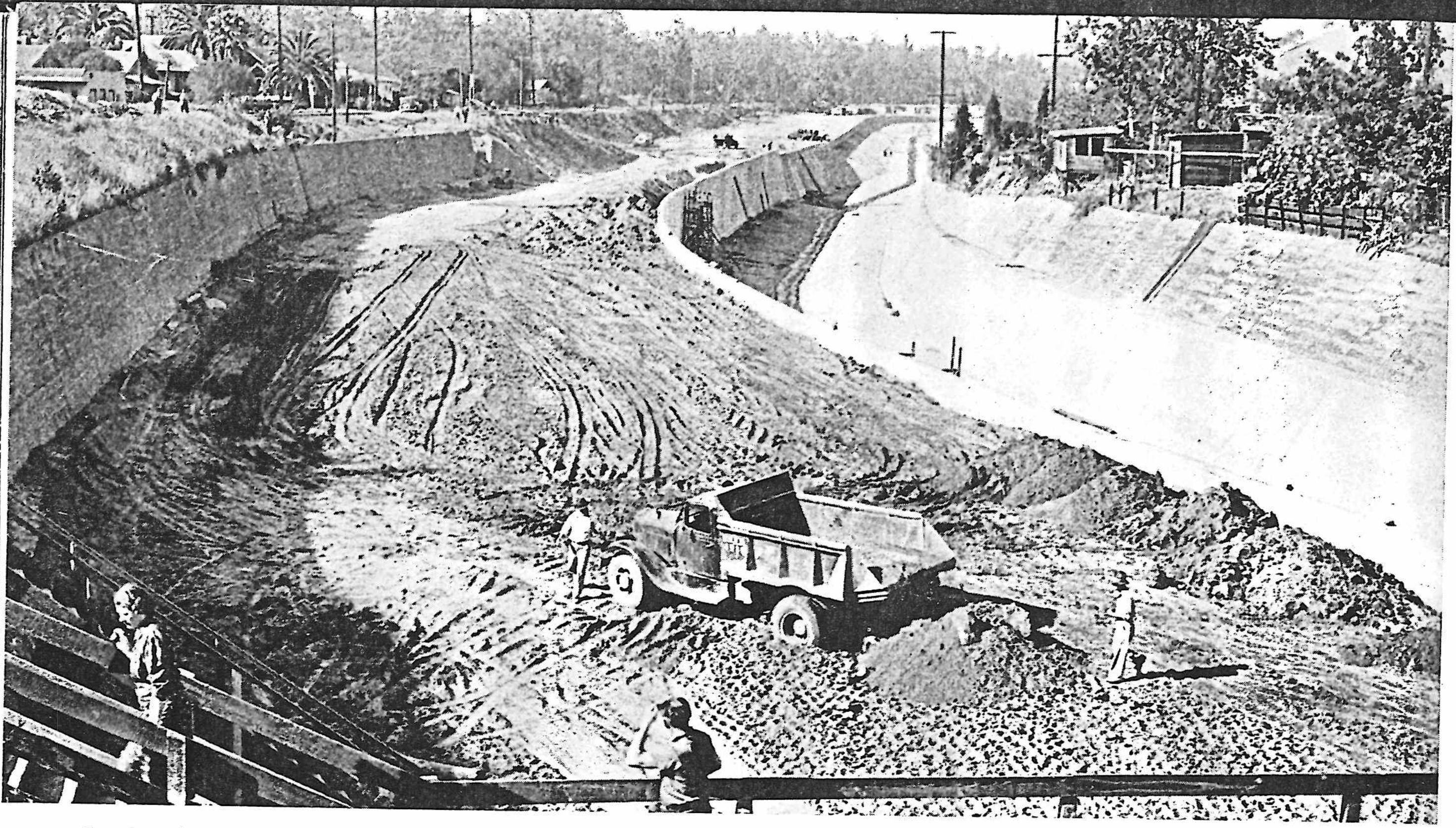
Comparatively little damage to adjoining property results from this location which follows through city of Los Angeles park lands for a considerable portion of the distance. On the contrary, a large number of citizens will drive every day through beautified park areas and the city thus secure a maximum beneficial use of the long narrow park.

An interesting side light in the construction of the "Parkway" is the recent utilization for the construction of highway embankments of more than 170,000 cubic yards of material excavated from the bed of the Los Angeles River near Dayton Avenue. This was material excavated by the U. S. Engineering Department in connection with their channel lining project on Los Angeles River.

This arrangement for securing excavated material was mutually beneficial to the U. S. E. D. and the State since it provided a location readily accessible for the disposal of surplus



Bridge across Arroyo Seco Parkway on Orange Grove Avenue, Pasadena, is shown under construction flanked by off and on ramps.



Constructing and compacting fill for Arroyo Seco Parkway which closely parallels the concrete lined arroyo channel throughout this section.

material from the river bottom and at the same time has enabled the State to have constructed a considerable portion of the highway embankments between Avenue 22 and Pasadena Avenue at only the comparatively small cost of spreading and compacting the material.

The design and construction of this "Freeway" is a matter which is receiving the closest cooperation between the State, the cities of Los Angeles, South Pasadena and Pasadena, the various railroads involved, and Federal agencies. Only by such cooperation could the many intricate steps necessary for such a project be properly coordinated.

Plans for the "Parkway" include construction or partial reconstruction of sixteen street and railroad bridges crossing over the highway. These are at Avenue 26, Pasadena Avenue (in Los Angeles), Santa Fe and U.P.R.R. bridge near Pasadena Avenue, Avenue 43, Avenue 52, Hermon Avenue, Avenue 60, Marmion Way, all of which are in the city of Los Angeles, and Arroyo Drive, Grand Avenue, Orange Grove Avenue, Prospect Avenue, Meridian Avenue, Fremont Avenue, the U. P. and Santa Fe Bridge near Fremont Avenue and Fair Oaks Avenue which are in the city of South Pasadena.

The Santa Fe R. R. and Pasadena Avenue and Union Pacific R. R. crossings near the city limit of South Pasadena were already in place, the "Parkway" passing under these two structures. A bridge near the South Pasadena city limit will carry the "Parkway" across the Arroyo Seco Channel. In addition to the above listed bridges a viaduct has been constructed from the northerly end of the Figueroa tunnels across Los Angeles River, the S. P. R. R. and San Fernando Road over which "Parkway" traffic will be carried to connect with downtown Los Angeles via Figueroa Street.

At present the only section of the route open to traffic is from Glenarm Street in Pasadena to Fair Oaks Avenue in South Pasadena, a distance of 0.76 mile, which was completed January 4, 1939, at a cost of $120,000.

The viaduct over Los Angeles River and adjacent railroads and streets was completed in 1937 at a cost of $680,000. The Arroyo Drive and Grand Avenue bridges were constructed during 1938 under one contract at a total cost of $111,000. The Avenue 60 bridge was completed March 3, 1939, at a cost of $59,000. The 0.75 mile highway section from Hough Street in Los Angeles to Meridian Street in South Pasadena including the Prospect Avenue and Orange Grove Avenue bridges, is under contract and will be completed late next fall. This section is estimated to cost $177,000. Included also within these limits is the bridge crossing the Arroyo Seco Channel which will cost $141,000. Bids for the Avenue 43 bridge were taken May 18, 1939, the low bid being about $43,000.

WPA AND CITY COOPERATE

The next section which will be let to contract is from Avenue 50 to Avenue 58 including the Avenue 52 and Hermon Avenue bridges and grade separations. This will be followed by contracts for the Fremont Avenue Bridge and the highway section from Avenue 58 to Arroyo Drive.

In the meantime, the WPA project by the city of Los Angeles for lining the Arroyo Seco Channel and constructing storm drains, which must necessarily precede a considerable portion of the highway work, is being carried on. Plans for other bridges and highway sections of this route are being prepared and contracts will be let as soon as progress on the storm drains and Arroyo Seco Channel lining will permit.

Contracts completed or now in progress represent an outlay by the

State of $1,331,000. The total estimated cost of the Arroyo Seco Parkway proper which includes highway and bridge work is $3,745,000. This would indicate that approximately 36 per cent of the work has either been completed or let to contract. In addition to this the State will pay its proportionate share of the cost of materials for storm drains and lining the Arroyo Seco Channel.

EXTENSIVE LANDSCAPING

An outstanding example of the splendid cooperation which the park departments of the cities of Los Angeles, Pasadena and South Pasadena have given the Division of Highways is the landscaping of the recently completed highway section between Glenarm Street in Pasadena, and Fair Oaks Avenue in South Pasadena. Landscaping of this section has been planned by the park departments of the cities of Pasadena and South Pasadena in cooperation with the State highway landscape engineer and suitable plants and shrubs are being planted by these departments from stock propagated in their own nurseries at no cost to the State.

It is too early to accurately predict the date when the "Parkway" will be opened to traffic for its full length. This will depend on a number of factors, the principal one of which is the completion of lining of the Arroyo Seco Channel between Avenue 36 and Avenue 22, which must be completed before this portion of the "Parkway" can be let to contract. From present indications, it is reasonable to expect the entire project will be completed toward the latter part of next biennium which ends June 30, 1941.

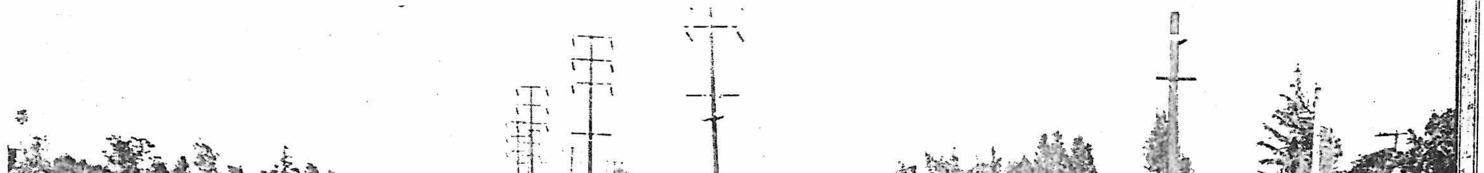
Supplementing the Arroyo Seco Parkway proper is the construction by the city of Los Angeles of Figueroa Street from the Figueroa Tunnels southerly to Sunset Boulevard including the College Street grade separation to facilitate the flow of traffic from the "Parkway" to the business district of Los Angeles.

Just southerly of Sunset Boulevard, Figueroa Street will pass under Temple Street on a grade separation now being constructed by the State. From the southerly limit of this contract at Diamond Street, preliminary plans are under consideration for improving Figueroa Street as far south as Second Street which will include a grade separation at First Street, this construction to be done by the State.

All of these improvements will form a comprehensive project for carrying traffic quickly and safely between downtown Los Angeles and the business district of Pasadena and intermediate communities. It is anticipated that the average driving time between the two cities will be reduced one half, which estimate is not based on excessive speeds but rather on the continuous flow of traffic without the interruptions of intersecting streets and railroads.

"Have you seen the new play I wrote about the couple who were always quarreling?"

"No, but I heard you and your wife rehearsing it."



Newly completed bridge on the Arroyo Seco Parkway at Grand Avenue. Sixteen street and railroad bridges will cross the parkway.

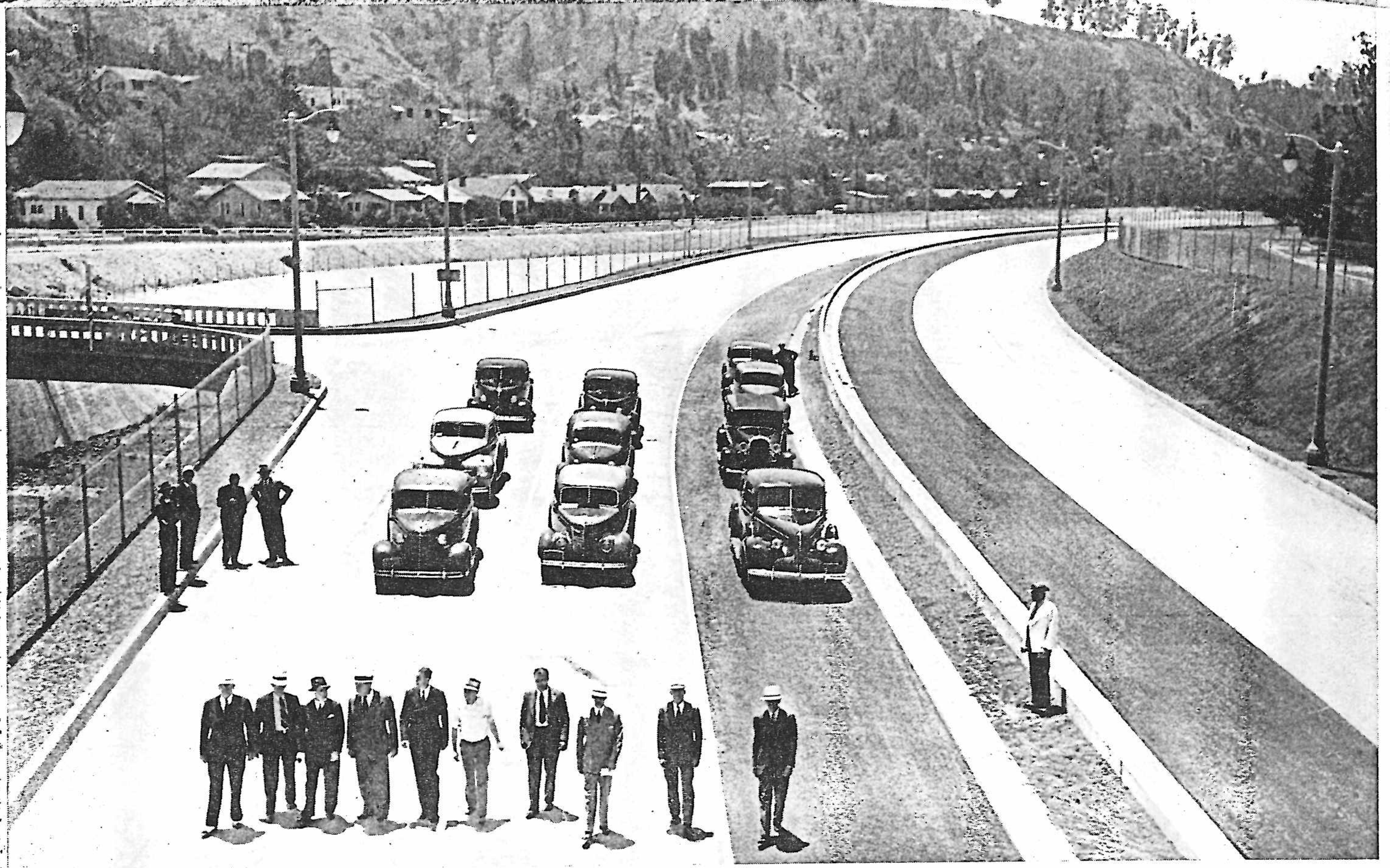


Photo Courtesy Los Angeles Herald-Express

State, county and city officials inspecting 3.7 miles completed section of Arroyo Seco Parkway. Third from right is Public Works Director Clark.

Arroyo Seco Parkway Unit Open

By S. V. CORTELYOU, District Engineer

CONSTRUCTION barricades were removed at six o'clock Saturday morning, July 20th, and a 3.7 mile section of the new Arroyo Seco Parkway, between Orange Grove Avenue in South Pasadena and Avenue 40 in the City of Los Angeles, was opened to traffic.

This section of modern freeway has not been entirely finished, inasmuch as the planting of shrubs in the central dividing strip and on each side of the freeway has not been completed. However, it was desired to give the public the benefit at the earliest possible time of this new safety highway, especially as it will remove the through traffic from the long business area in Highland Park and permit it to develop naturally without the handicap of a large volume of nonpurchasing through traffic which interfered with their local customers.

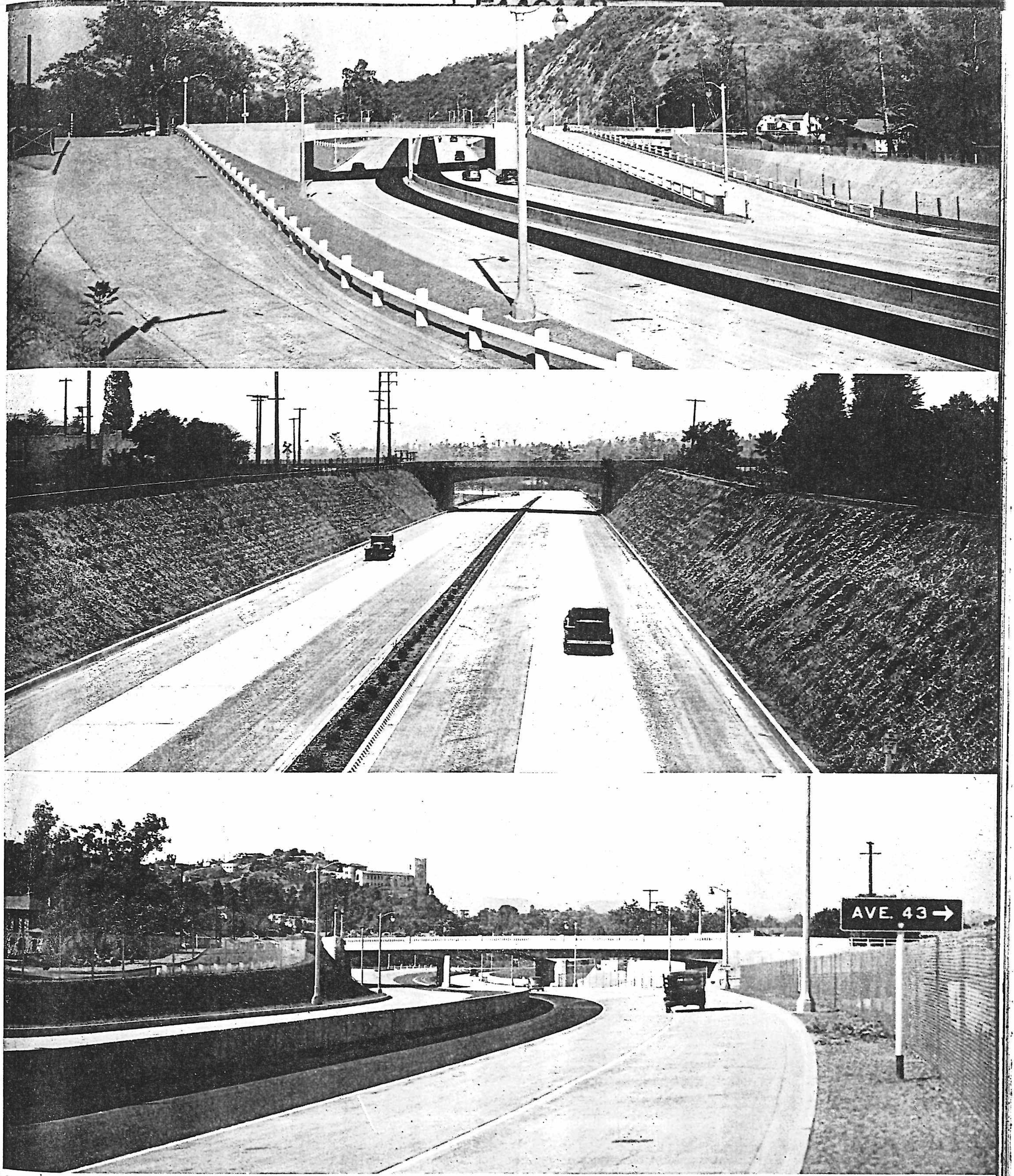
This 3.7 mile section and the 0.8 mile portion between Glenarm Street in Pasadena and Fair Oaks Avenue, opened to traffic last year, make a distance of 4.5 miles of the Arroyo Seco Parkway now giving service to the motorists. The only two "gaps" remaining to be completed, are from Avenue 40 to Avenue 22 in Los Angeles (one mile) and from Meridian Street to Fair Oaks Avenue in South Pasadena, a distance of 0.4 mile.

Work on the former section is progressing rapidly under three separate contracts, and will be completed about November 1st. The portion between Meridian Avenue and Fair Oaks Avenue in South Pasadena will be let to contract within a short time and it is anticipated that the entire 6-mile project from Glenarm Street in Pasadena to Avenue 22 in Los Angeles will be completed early next spring.

Much favorable comment is heard from those using the new freeway in that it is so much safer, more convenient and requires so much less time than the old route via Figueroa Street.

The reasons for these improved traffic conditions are built into the highway itself—three wide traffic lanes on each side of a raised central dividing strip with high standards of alignment and no streets or railroads crossing at grade.

NRLF PAGING REQUEST



Arroyo Seco Parkway sections between Pasadena and Los Angeles recently opened showing 35-foot divided lanes, bridges and service roads.

Traffic after entering the Parkway can proceed at the maximum State speed limit for an open road and does not need to stop until after leaving the Parkway. All curves are suitably "banked" or superelevated for safety at legal speeds.

At appropriate and convenient locations, inlets and outlets are provided by means of one-way roads or ramps with widened pavement at these points for blending with or withdrawing from the faster moving traffic on the main freeway.

Turning movements across traffic are entirely eliminated by a raised curb central dividing strip without openings or cross overs. One can travel this highway with the assurance that a car will not suddenly emerge from a side street or cross over the center line and approach "head on." Thus traffic on the three lanes of pavement in each direction moves with a freedom from interference not experienced on any but the most modern of highways.

ROAD CAPACITY INCREASED

As a result of this safety and freedom of movement and elimination of all stops, there is a material increase in the carrying capacity of the highway. On the average highway in a densely populated area similar to this one, intersection delays and interference from turning movements tend to "pile up" traffic and release it in waves rather than in a steady flow, thereby reducing to a large degree the traffic carrying capacity of the highway. These unfavorable conditions have been entirely eliminated in the Arroyo Seco Parkway in accordance with the most modern trend in highway design.

On the portion of the highway just opened to traffic, intersecting streets cross the Parkway on overhead bridges at Avenue 43, Avenue 52, Hermon Avenue, Avenue 60, Marmion Way, Pasadena Avenue, Arroyo Drive, Grand Avenue and Orange Grove Avenue.

Traffic in either direction can enter at Avenue 43, Avenue 52, Avenue 57, Hermon Avenue, Avenue 60 and Marmion Way. Traffic traveling toward Los Angeles can also enter at Salonica Avenue.

Traffic in either direction can leave the Parkway at Avenue 43, Avenue 52, Avenue 57, Hermon Avenue, Avenue 60 and Marmion Way, and traffic traveling toward Pasadena can also leave at Hough Street.

Planning and construction of the Arroyo Seco Parkway has required the closest cooperation among the various governmental and corporate agencies involved. The project lies within three cities, namely Los Angeles, South Pasadena and Pasadena, and the engineering departments and other officials of these three cities have worked in close harmony with the State Division of Highways.

Director Clark congratulating Resident Engineer Hatfield.

City Engineer Harvey W. Hincks of Pasadena and his assistants made early plans for the Parkway in Pasadena and South Pasadena. Special mention should be made of the very effective efforts of City Engineer Lloyd Aldrich of Los Angeles in securing for the people of Los Angeles City, after numerous trips to Washington, D. C., the allotment of large amounts of Federal Relief Funds for important engineering projects in Los Angeles City.

One of the most important of these was their financing of the paved channel for the Arroyo Seco flood waters from South Pasadena to the Los Angeles River. Without this control of the flood waters, it would not have been possible to build and maintain the Arroyo Seco Parkway in it present location.

Also, much credit is due Mr. Aldrich and his Deputies, Merrill Butler, L. E. Arnold, C. J. Shults, L. W. Armstrong and R. W. Stewart, for preparation of plans for the Parkway with its large number of bridge structures, in cooperation with the State engineers.

RESULT OF COOPERATION

The Park Commission of Los Angeles City has cooperated, not only in furnishing to the State the right of way for the Parkway from the north city limits to Avenue 35, but in assisting in the general landscaping program.

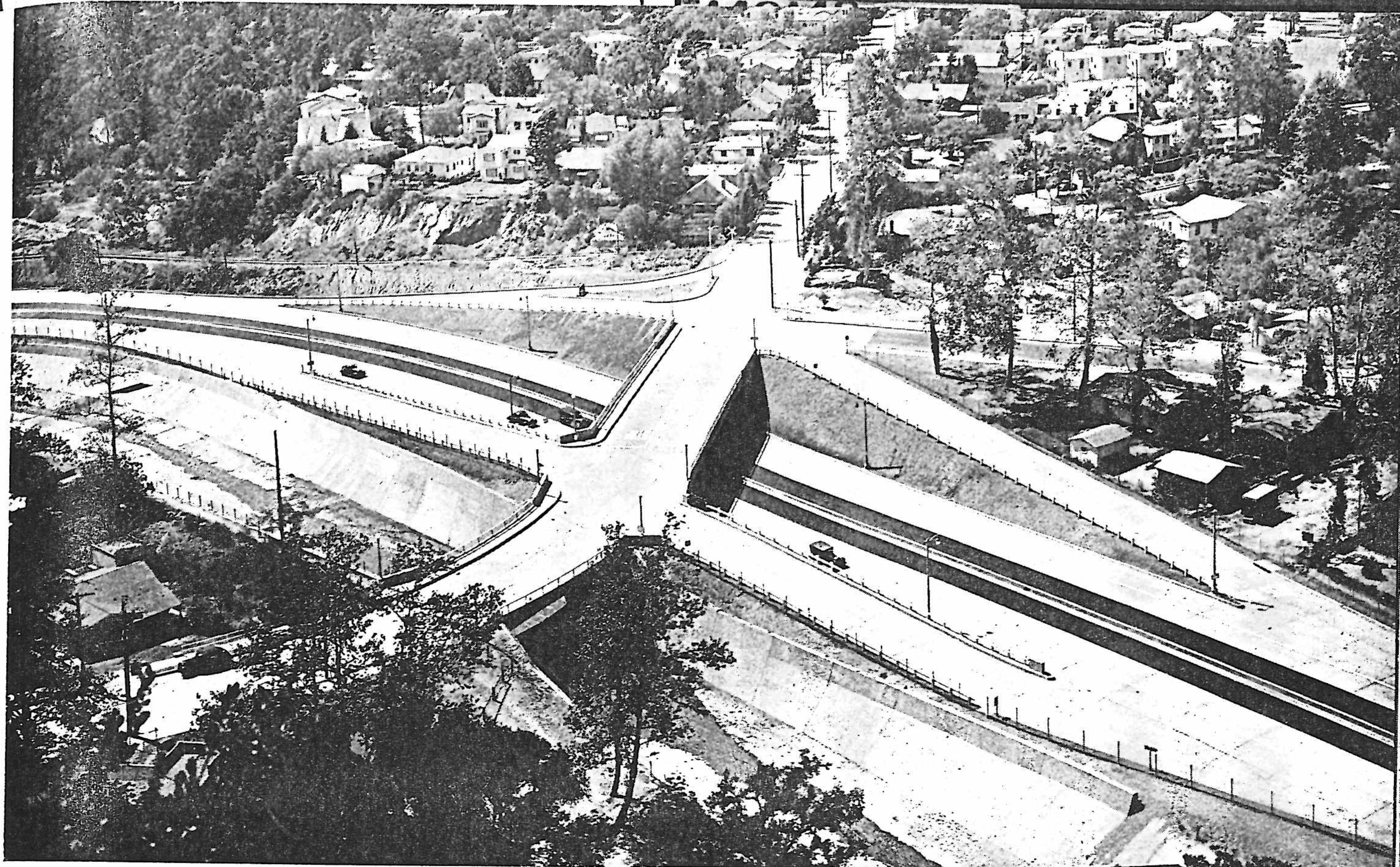
The U. S. Public Roads Administration, the Works Progress Administration and the Public Works Administration have had important parts to play in the construction of the Parkway and of storm drains and lining the Arroyo Seco Channel to properly care for flood waters and protect the Parkway from damage.

The Santa Fe and Union Pacific Railroads were interested in that they each crossed the Parkway in two places. These railroads cooperated with the State in arranging for the necessary changes in their facilities on their private rights of way to fit in with the Parkway, in such a manner as to involve a minimum cost to the State.

DOUBLE RAILROAD BRIDGE

On the Parkway east of Orange Grove Avenue in South Pasadena, there are now under construction the Meridian Street Bridge, Fremont Avenue Bridge, Fair Oaks Ave-

NRLF PAGING REQUEST



Arroyo Seco Parkway at Avenue 52 is crossed by 2 bridges, one with ramps and other over paved stream channel.

nue Bridge, and a double track railroad bridge at Freemont Avenue to carry the Santa Fe and Union Pacific Railroads over the depressed Parkway. At the proper stage of construction of these bridges, the final highway contract will be let for roadway grading and paving between Meridian Street and Fair Oaks Avenue, which will complete the entire Arroyo Seco Parkway from Glenarm Street in South Pasadena to Avenue 22 at the Los Angeles River Viaduct in Los Angeles.

The entire project is being fenced with a high ornamental fence to prevent pedestrians or animals from having access to the Parkway. Since children and elderly persons will use this long stretch of City Park, it was absolutely necessary to make it impossible for them to stray onto the Parkway with its large volume of fast moving traffic. The fences will be covered with a leafy screen of appropriate shrubbery.

EXTENSIVE PLANTING PROGRAM

In cooperation with the City Park Departments of Los Angeles, Pasadena and South Pasadena, the full length of the Parkway is being landscaped under State supervision. The work includes planting the slopes and the strip between the central dividing curbs as well. This new highway will be truly a "Parkway," beautiful as well as serving traffic to the fullest extent.

The new section over which thousands of Southern California people have driven during the last few days gives an idea of the motoring comfort which will be enjoyed in the future by the vastly greater number of people who daily or frequently travel between Los Angeles and Pasadena, and the territory contiguous to the Arroyo Seco Route.

All construction work on the Parkway with its many bridge structures has been under the supervision of the State Division of Highways. The State also furnished the sponsor's fund for the W.P.A. channel work from Avenue 52 to the Los Angeles River.

SOURCES OF FUNDS

The total cost of the Arroyo Seco Parkway from Avenue 22 in Los Angeles to Glenarm Street in Pasadena will be approximately $5,000,000 including the portion of the storm drain and channel work essential to the Parkway. This was financed by the various governmental units as follows:

State 1½¢ Gas Tax Fund	$2,614,547.72
¼¢ State Highway Gas Tax for Pasadena	335,981.98
¼¢ State Highway Gas Tax for South Pasadena	64,778.36
¼¢ Streets of Major Importance Gas Tax for South Pasadena	12,271.04
¼¢ State Highway Gas Tax for Los Angeles	40,000.00
South Pasadena City Funds	644.16
Los Angeles City Funds	113,584.14
P.W.A. Funds	472,315.63
W.P.A. Funds	1,394,364.73
Total	$5,048,487.46

In addition to the above, the cost of the Arroyo Seco Channel work as a Federal Relief Labor project under City Engineer Aldrich, including Federal costs, was about $7,000,000, making a grand total for the combined projects of $12,000,000.

One engineer to another: Grab the end of that wire.

"All right."

"Feel anything?"

"No."

"Well, then, don't touch the one next to it—it's got over 5000 volts."

Proposed Arroyo Seco Parkway Extension to Los Angeles Business Center Through Elysian Park

By A. D. GRIFFIN, District Office Engineer, District VII

IN AND around the metropolitan Los Angeles area it is almost a foregone conclusion that when a new improved highway facility is opened to the public so large a volume of traffic is attracted to it that the adjoining sections of this highway which have not already been adequately improved become badly overtaxed. We are certain to face this situation when the Arroyo Seco Parkway is completed, particularly from the southerly terminus at Avenue 22 into the business district of Los Angeles city.

Los Angeles city and county traffic authorities, and the general public who will use the Arroyo Seco Parkway between Los Angeles and Pasadena after it is completed, are even now asking the question:

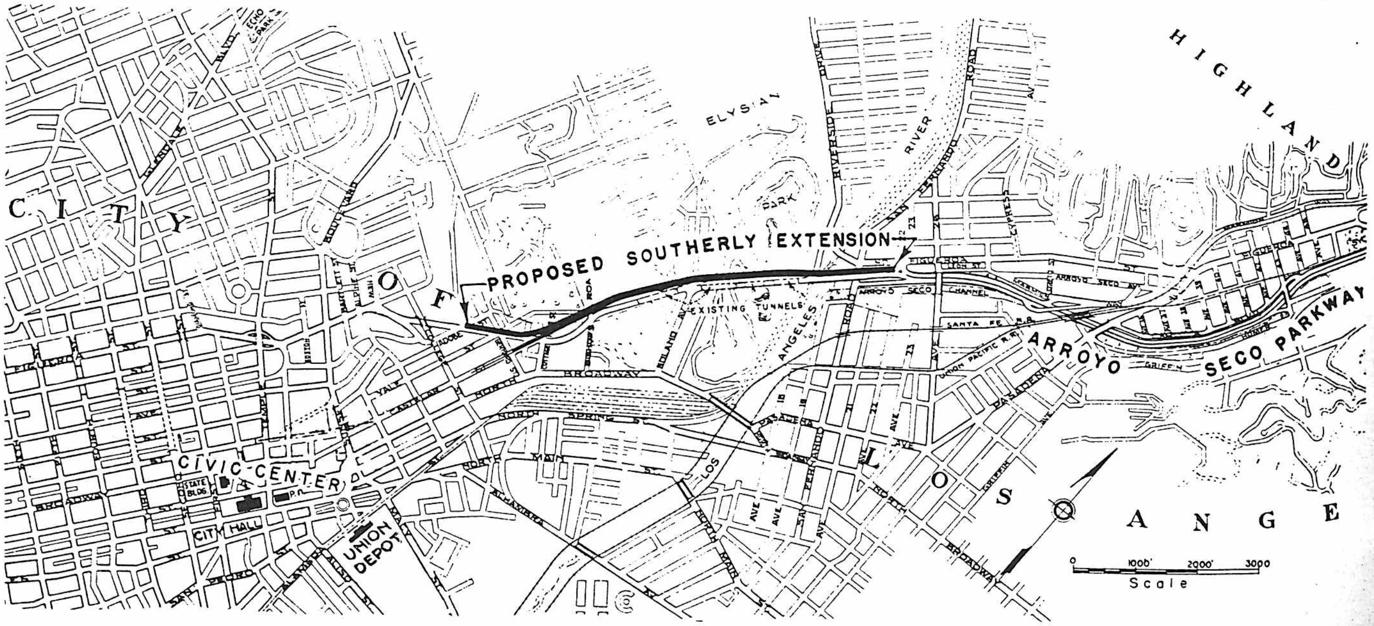
"What does the State propose to do in Los Angeles city from Avenue 22 southerly along North Figueroa Street, in order to relieve the bad traffic congestion across the Los Angeles River Bridge, through the Riverside Drive intersection, and in the four Elysian Park tunnels where even now during the morning and evening rush hours the traffic delays are intolerable?"

Existing traffic congestion on North Figueroa Street is shown by recent photographs accompanying this article. It is not difficult to imagine what will happen when the Arroyo Seco Parkway is opened to traffic before the proposed increased facilities to the south have been completed.

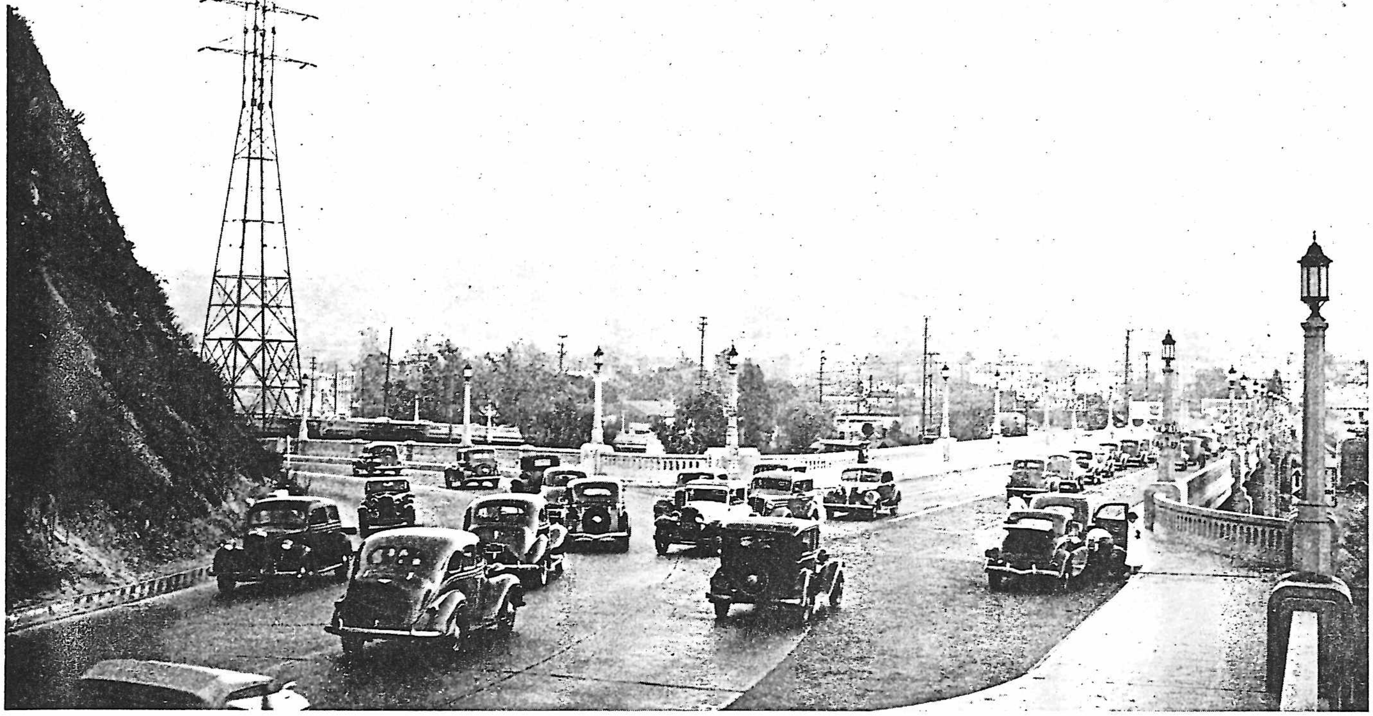
The general plan developed by the State for handling this situation is—

1. **Use the four existing tunnels, roadway and bridge over Los Angeles River between Castelar Street and Avenue 22 for northbound traffic only.**
2. **Construct additional four-lane bridge across the Los Angeles River upstream from existing bridge, the grade of the southerly end of the bridge to be above Riverside Drive, permitting northbound Riverside Drive traffic to turn left under the new bridge.**
3. **Construct a four-lane roadway, in open cuts if possible, for southbound traffic on the westerly side of existing tunnels and at a higher elevation to facilitate grade separations for traffic at Solano Avenue, Bishops Road and at Castelar Street.**
4. **The new work on Figueroa Street from Avenue 22 to Adobe Street to be on a freeway basis.**

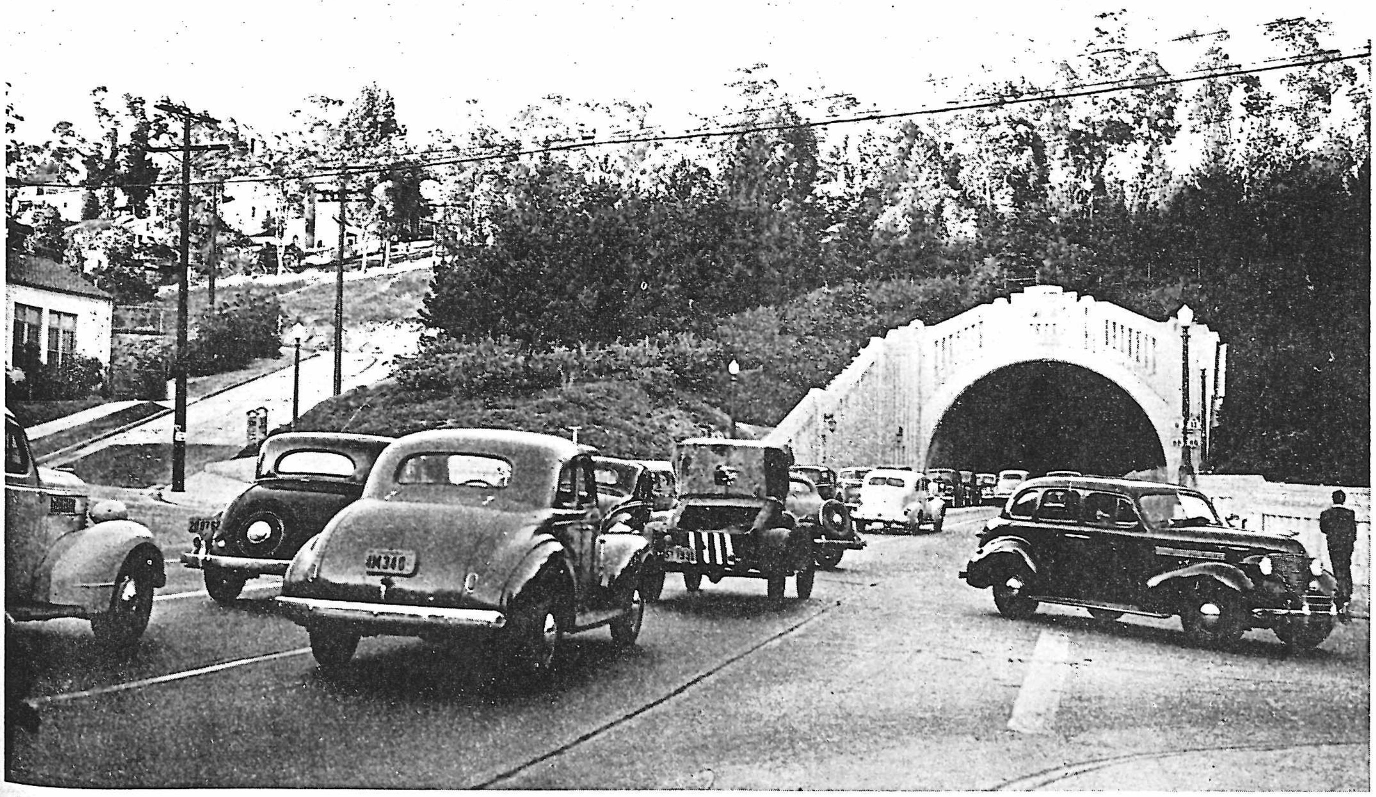
At the time the city of Los Angeles built the existing tunnels they ex-



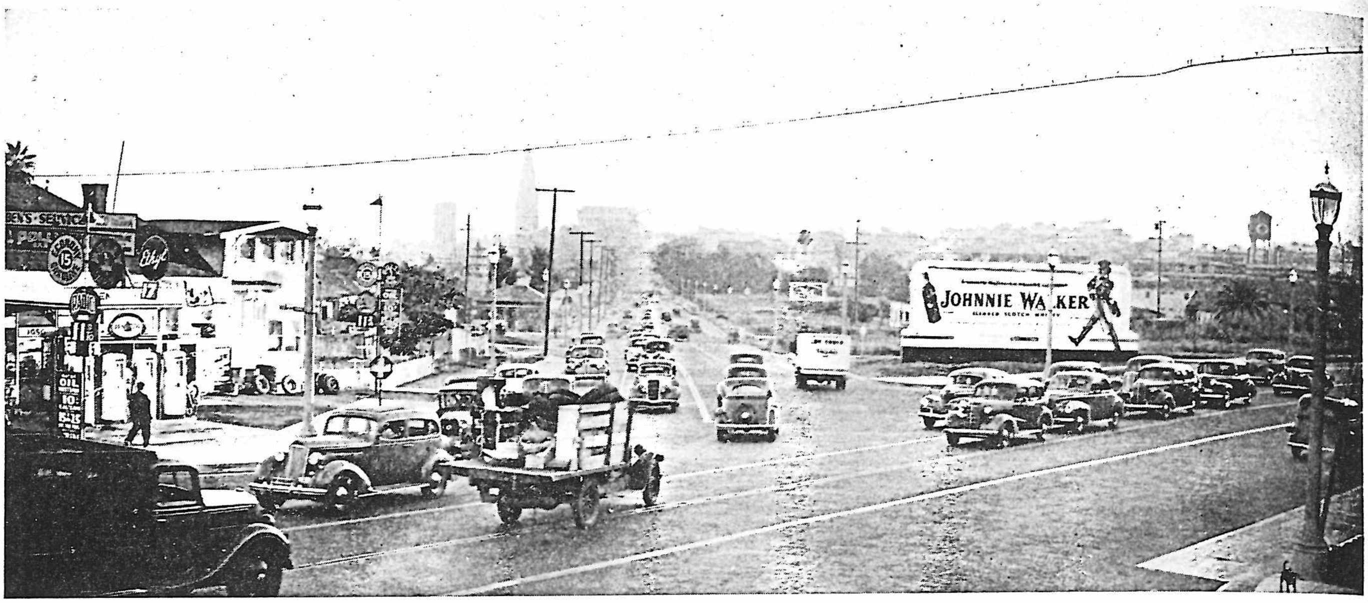
Map of Proposed Southerly Extension of Arroyo Seco Parkway into Los Angeles Business District



North Figueroa Street Bridge over Los Angeles River showing effect of traffic making left turn for Riverside Drive



Traffic through North Figueroa Street tunnels meets cross traffic at Solano Street intersection



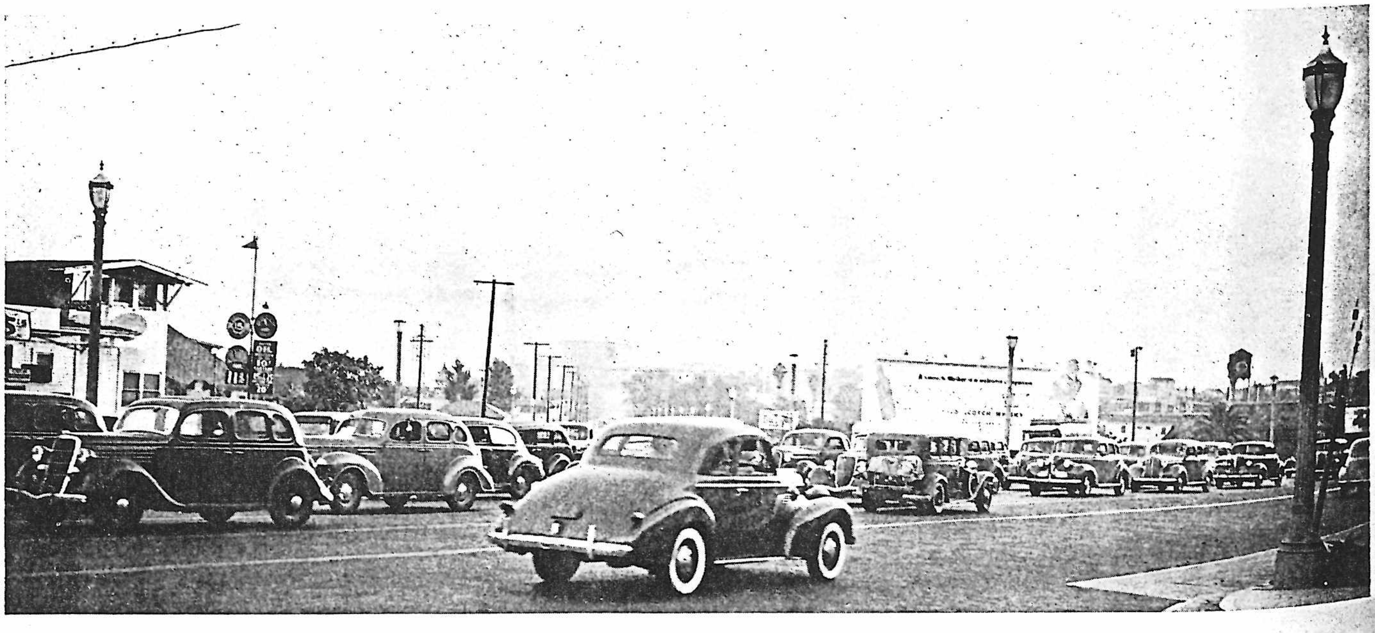
At top and bottom—Views looking southerly along Castelar Street showing interference of late afternoon traffic on North Figueroa Street by reason of southbound traffic on Figueroa Street making left turn into Castelar Street. This condition will be eliminated by a grade separation on proposed extension route

pected, when traffic developed sufficiently to require it, to construct a parallel line of tunnels. A recent estimate by the city for an additional four-lane bridge across the Los Angeles River and the additional line of tunnels and four-lane roadway from Avenue 22 to Adobe Street was given out as $2,500,000.

By reason of the fact that considerable PWA and WPA Federal funds became available for the Arroyo Seco Parkway construction which were not anticipated when the highway budget was adopted, savings have resulted in the State budgeted funds. The California Highway Commission made these savings available for starting work on the Arroyo Seco Parkway Southerly Extension through Elysian Park leading into downtown Los Angeles.

A study was made to determine the possibility of substituting open-cut construction for the roadway through the Elysian Park Hills instead of tunnel construction. Roadways in open-cuts are preferable to tunnels because of greater safety and efficiency in vehicular operation, and also because of greater possibilities for beautification and landscaping. This study of "open-cut versus tunneling" immediately raised the question of stability of the cut slopes and involved us in geological considerations.

District Materials Engineer R. J. Allan, who has had considerable training and experience in geological and mining studies and investigations, made an extensive geological survey of this portion of the Elysian Park area through which the North Figueroa Street tunnels have been constructed. The studies conducted

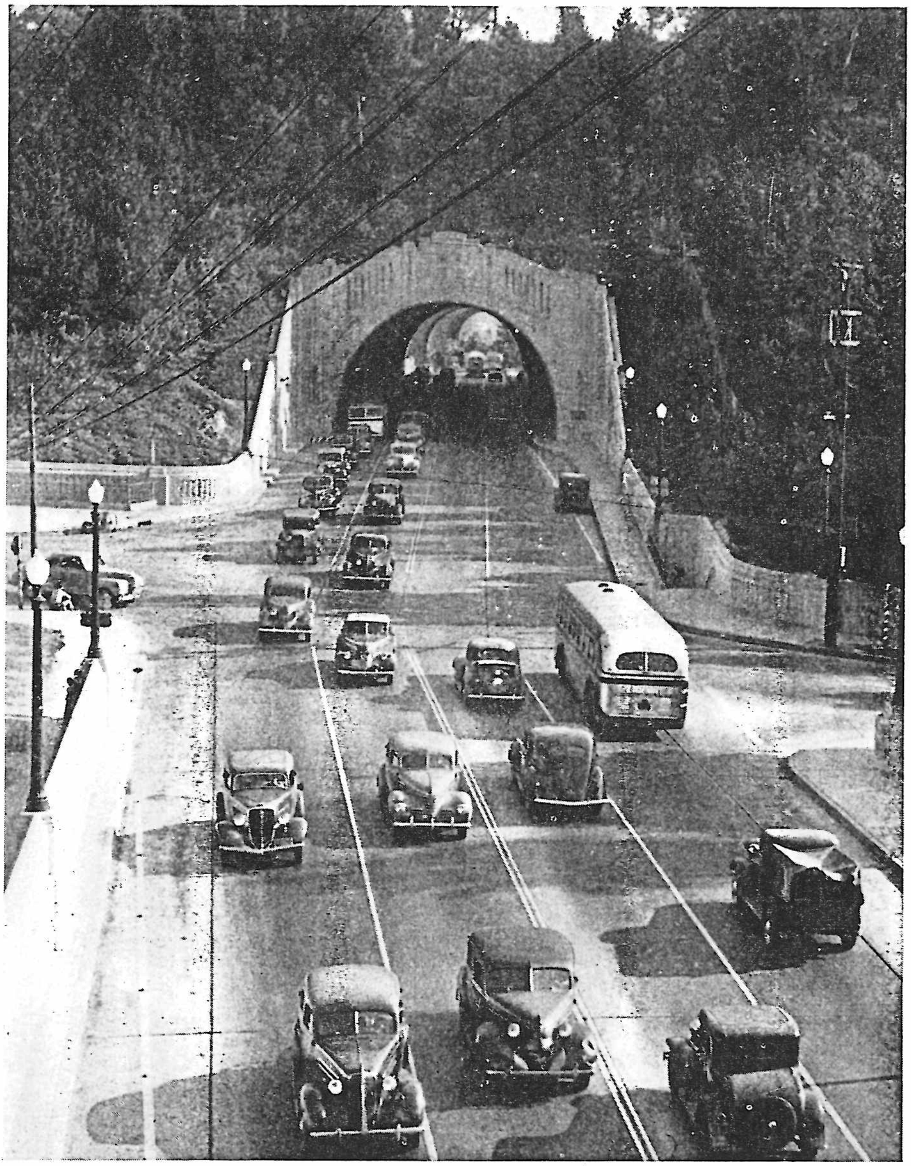


by Mr. Allan were for the purpose of answering questions as follows:

1. If open cuts are constructed instead of tunnels, what cut slopes should be used in order to be assured of safety from future landslides?
2. What would be the effect of eccentric loading on the existing tunnels due to open cut construction nearby?
3. What would be the closest distance from existing tunnels that open cuts could be constructed without danger of damage to the existing tunnels?
4. What would be the future possibility of damage due to earthquake action?

Some years ago a large landslide occurred in Elysian Park, only one-fourth mile distant from the northerly portal of the North Figueroa Street Tunnel near the Riverside Drive connection and city authorities were fearful of possible damage to the tunnels because of landslide conditions. Dr. John P. Buwalda, eminent geologist of California Institute of Technology, was engaged to make a geological study by the city to determine safety of existing tunnels.

Because of Dr. Buwalda's familiarity with this vicinity, the State engaged him as a Consulting Geologist in regard to feasibility and safety of the district's plans for open-cuts instead of tunnels for the contemplated Arroyo Seco Parkway Extension southerly through the Elysian Park Hills. It was most gratifying to find that Dr. Buwalda's investigations and report gave full approval of our plans. Geological reports are not always "dry as dust" although they largely deal with ancient happenings and certain sections of Dr. Buwalda's geological report of August 21, 1940, which will be of interest to readers of this article, are being quoted:



View through three Figueroa Street tunnels under Elysian Park

"*GEOLOGY*—The rocks of the North Figueroa Street tunnel area belong to the Puente formation, which is of Miocene age. The materials were laid down in the sea as sands and muds some 12 millions of years ago and, buried beneath thousands of feet of younger sediments, they became compacted to strata of sandstone and shale. They were further solidified by the deposition of calcium carbonate in the pore spaces, cementing the constituent particles together. The sandstones are hence harder than very young sedimentary formations or soils, but softer and less strong than granite.

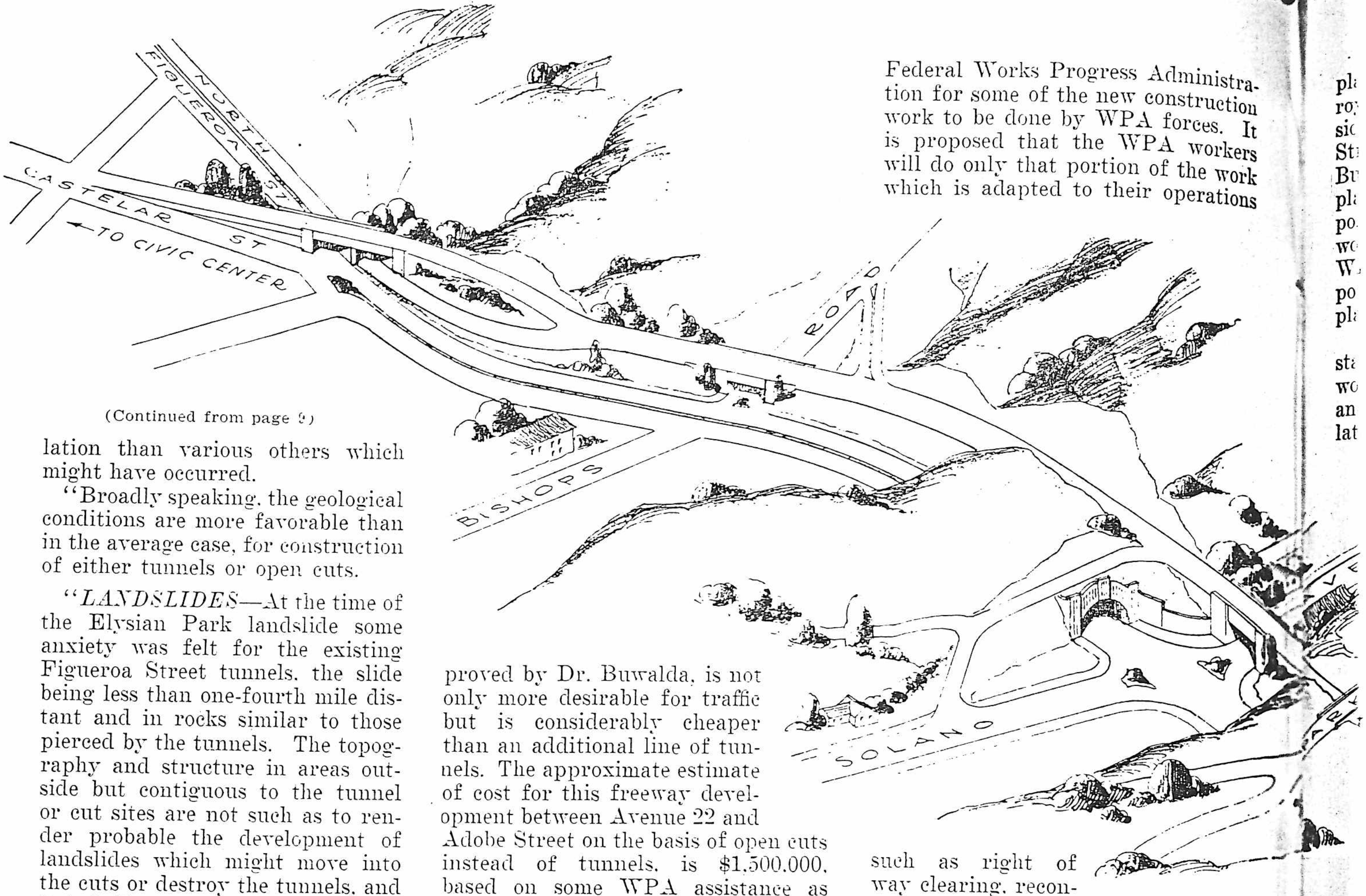
"In any region in which the strata have been tilted to angles of 30 or 45 degrees, minor faults develop in response to the inequality of relief afforded by the harder and softer parts of the formation. Such faults are seldom long and aside from shattering the rock somewhat locally they are not important. A number of such minor fractures are exposed in the tunnel district but they are not seriously detrimental to engineering operations. No major faults pass through or near the Figueroa Tunnels.

"In some parts of southern California the rocks are so severely jointed as to make construction operations very difficult. The strata in the Figueroa Street tunnel district are only normally jointed and shattered rock is uncommon.

"The direction of the tunnels is such that they cross the moderately dipping strata at a large angle, which is a much more fortunate re-

(Continued on page 14)

Sketch of Proposed Arroyo Seco Parkway Extensio



(Continued from page 9)

lation than various others which might have occurred.

"Broadly speaking, the geological conditions are more favorable than in the average case, for construction of either tunnels or open cuts.

"*LANDSLIDES*—At the time of the Elysian Park landslide some anxiety was felt for the existing Figueroa Street tunnels, the slide being less than one-fourth mile distant and in rocks similar to those pierced by the tunnels. The topography and structure in areas outside but contiguous to the tunnel or cut sites are not such as to render probable the development of landslides which might move into the cuts or destroy the tunnels, and it is believed that adoption of 1:1 slopes, with the exceptions noted, will prevent landsliding in the walls of the cuts.

"*EARTHQUAKES*—California is an earthquake region and it is certain, taking into account the recorded shock history of the State, that the tunnels and cuts will experience severe shaking during their lifetime. If tunnels are built earthquake accelerations should be taken into account in the design and construction. It is believed that 1:1 slopes, with exceptions mentioned, will be stable in an earthquake of the magnitude and intensity of the San Francisco earthquake of 1906, which is probably as strong a shock as it is economically practicable to guard against."

The open cut construction, the safety and stability of which was approved by Dr. Buwalda, is not only more desirable for traffic but is considerably cheaper than an additional line of tunnels. The approximate estimate of cost for this freeway development between Avenue 22 and Adobe Street on the basis of open cuts instead of tunnels, is $1,500,000, based on some WPA assistance as hereinafter outlined. City of Los Angeles officials concur in this solution of the problem of creating a freeway extension for the Arroyo Seco Parkway. Although plan preparation is barely started and design details still have to be worked out, the general scheme for Arroyo Seco Parkway Southerly Extension through Elysian Park is shown on the perspective sketch accompanying this article.

The Federal authorities, realizing that many WPA projects in this vicinity are drawing to a close, are very anxious to have other important public work available to utilize workers from the large reservoir of unemployed in the metropolitan Los Angeles area. There are certain portions of the work on the proposed Southerly Extension of the Arroyo Seco Parkway on which these WPA workers can be used advantageously.

Mr. Frank W. Clark, Director of Public Works, has arranged with the Federal Works Progress Administration for some of the new construction work to be done by WPA forces. It is proposed that the WPA workers will do only that portion of the work which is adapted to their operations such as right of way clearing, reconstructing of Elysian Park facilities, carrying out roadway grading, constructing retaining walls and other related work.

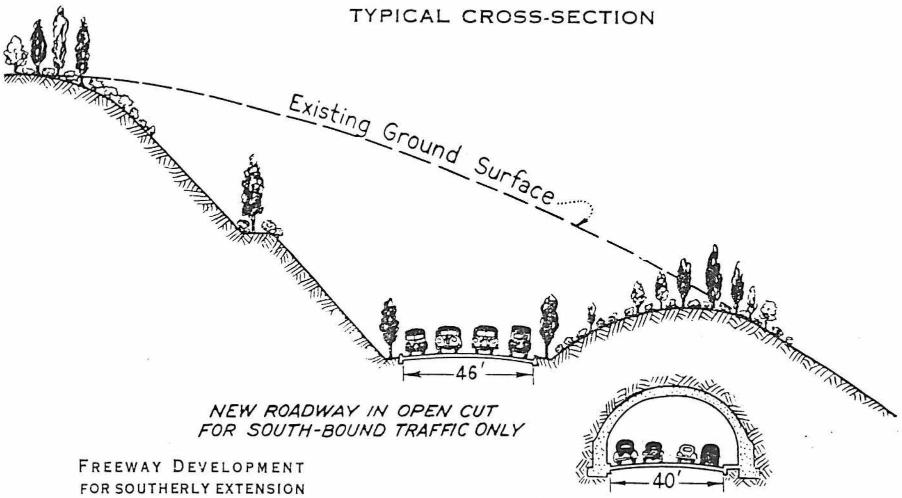
The substructure for the proposed new bridge on the Los Angeles River to carry southbound traffic is also work that will be handled by the WPA forces. It is then proposed that the new Los Angeles River bridge superstructure and also the necessary bridge structures at Castelar Street, Bishop's Road, Park Row and Solano Avenue, which require intricate specialized work not appropriate for WPA operations, be constructed by advertising and letting State contracts in the usual way.

While much preliminary work has already been done this is a project which requires many intricate designs for storm drains, sewers, retaining walls, and bridge structures, and it will be several months before all

Through Elysian Park to Los Angeles Civic Center

plans can be completed for the Arroyo Seco Parkway Southerly Extension between Avenue 22 and Adobe Street, which is 1.5 miles in length. But during the interval while detailed plans are being prepared, it is proposed that certain of the construction work be carried out immediately by WPA day-labor operations on those portions of the project for which plans can be turned out quickly.

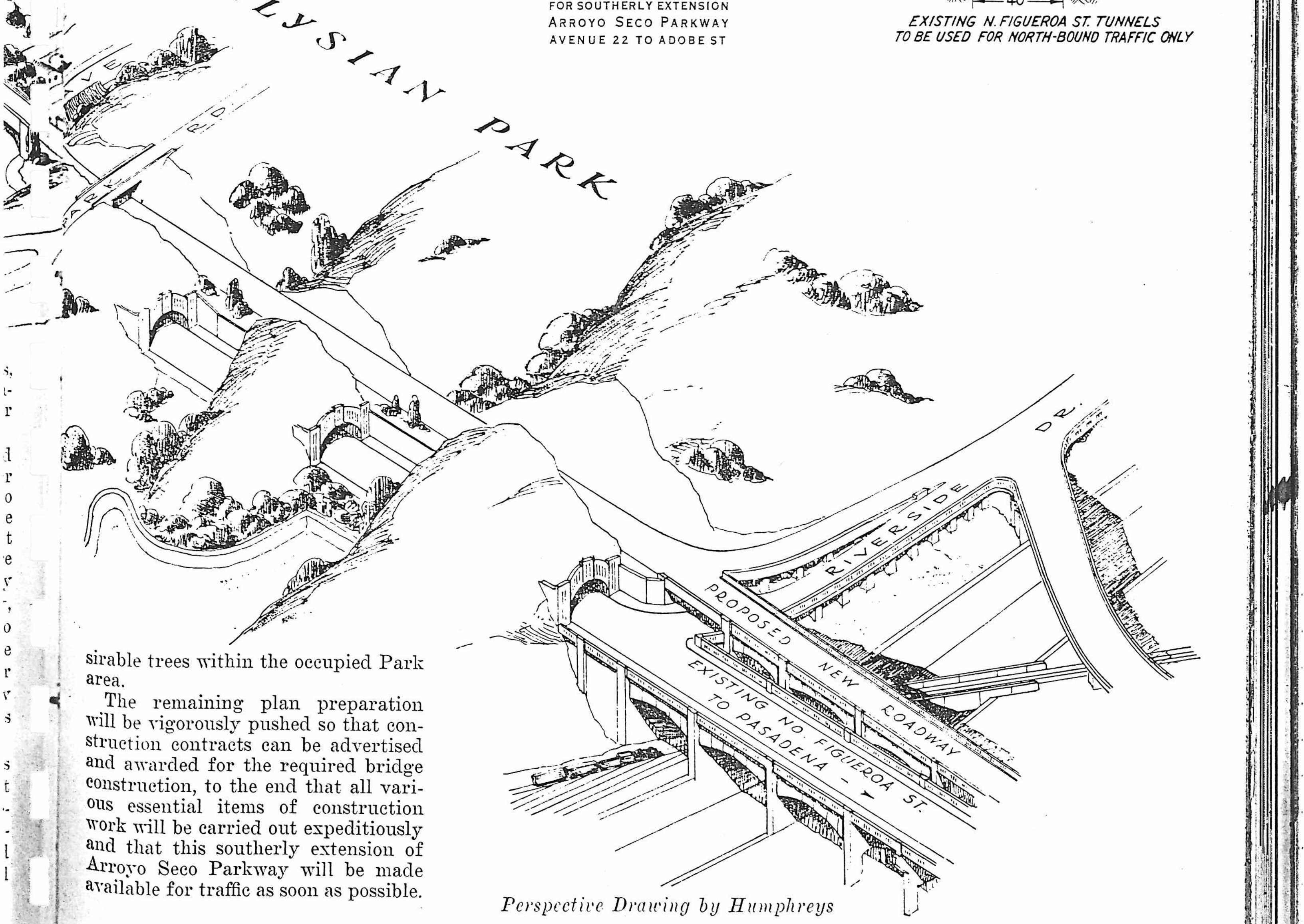
A large force of men has already started on the WPA portion of the work, clearing for the new open cuts and carefully boxing and moving for later replanting, all valuable or desirable trees within the occupied Park area.



NEW ROADWAY IN OPEN CUT FOR SOUTH-BOUND TRAFFIC ONLY

EXISTING N. FIGUEROA ST. TUNNELS TO BE USED FOR NORTH-BOUND TRAFFIC ONLY

FREEWAY DEVELOPMENT
FOR SOUTHERLY EXTENSION
ARROYO SECO PARKWAY
AVENUE 22 TO ADOBE ST



Perspective Drawing by Humphreys

The remaining plan preparation will be vigorously pushed so that construction contracts can be advertised and awarded for the required bridge construction, to the end that all various essential items of construction work will be carried out expeditiously and that this southerly extension of Arroyo Seco Parkway will be made available for traffic as soon as possible.

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Governor Olson Dedicates and Opens Arroyo Seco Freeway

By AMERIGO BOZZANI, State Highway Commissioner

CLIMAXING more than 25 years of dreaming and planning by visionaries and engineers, Governor Culbert L. Olson at noon on Monday, December 30, officially dedicated to public service the Arroyo Seco Parkway, the West's irst freeway, connecting the ities of Los Angeles, Pasadena nd South Pasadena.

Opening of California's most modern highway became a reality when Governor Olson and Sally Stanton, Queen of the 1941 Pasadena Rose Festival, ut a ribbon of roses of beautiful design strung across the parkway.

High dignitaries of the Federal and State governments and f the U. S. Army, together with officials of the County of Los Angeles and the three cities inked together by the parkway participated in the ribbon cutting which had been preceded on Saturday morning, December 28, by a symbolical and highly colorful ceremony staged in the Arroyo Seco. At he ceremony Chief Tahachwee f the Kawie Indians, whose ncestors lived in the Arroyo wilderness hundreds of years before the coming of Father Junipero Serra and his Franciscan mission builders, smoked he pipe of peace with Director f Public Works Frank W. Clark and to the beating of ribal drums relinquished the ights of his people in the Arroyo and formally transferred the property to the State.

FIRST FREEWAY IN WEST

A caravan of more than four hundred automobiles headed by army units and with E. Raymond Cato, Chief of the Highway Patrol, acting s grand marshal traveled over the ew highway from the Los Angeles city hall to the site of the dedication ceremonies, where a crowd of more than fifteen hundred persons heard a program of speech making and witnessed the final act in the drama of ultra modern highway construction.

"This," said Governor Olson in his dedicatory address, "is the first freeway in the West. It is only the first. And that is its great promise to the future—the promise of many more freeways to come."

GOVERNOR CULBERT L. OLSON

Built at a cost of approximately five million dollars, the Arroyo Seco Parkway provides a six-mile unit of a direct nine-mile highway link between the business districts of Los Angeles and Pasadena. It also serves Highland Park, Lincoln Heights, South Pasadena, San Marino, and other adjoining areas.

The project admirably exemplifies the spirit of cooperation between the Federal government through the Public Roads Administration, the Works Projects Administration, the Public Works Administration, the State of California and the cities of Los Angeles, Pasadena and South Pasadena, which made possible the completion of this great undertaking and has given California its first modern freeway.

Of the parkway and its significance, Governor Olson said:

My fellow citizens:

> We are gathered here to dedicate a new section of State highway. It is *only* 6 miles long. In average traffic the motorist will travel over it from one end to the other in 7, or 8, or perhaps 9 minutes. But in doing so he will have traveled from the very heart of Los Angeles, through Highland Park and South Pasadena, to the very heart of Pasadena. And he will have done it in easy, nerve-free comfort, and, *above all*, in SAFETY. All this is, to say the least, most extraordinary.
>
> Nevertheless, I suspect that after a few weeks the average motorist using this parkway will have become so used to it that all recollection will soon fade from his memory of how difficult, how tiring, and slow, not to say dangerous, it was to drive between Pasadena and Los Angeles.
>
> Therefore, before we start using this road (and it will surely have heavy use on New Year's Day) it is

Official party at the ribbon cutting ceremony of the Arroyo Seco Freeway dedication—Left to right, Amerigo Bozzani, Hig Commissioner, Chairman of the Celebration Committee; Director of Public Works Frank W. Clark; Sally Stanton, Queen of the Rose Festival; Governor Culbert L. Olson; Larry Barrett, Chairman, Highway Commission and Ray Cato, Chief, State Highway P

proper and timely, a *very* good thing, in fact, for us to pause a few moments—NOW—to ceremonialize and celebrate an achievement so extraordinary as the completion of this, the Arroyo Seco Parkway.

GREATER THINGS AHEAD

Let us briefly consider what has been done here, and why, and what it means to the community. Let us do this before it fades from memory. Let us do this before we rush headlong into the accomplishment of even greater achievements—for that is exactly what we shall soon be doing, because, in large part, of the knowledge and experience gained here.

In dedicating this Parkway we do honor to the men and women in whose dream, so long held and so long pursued, it had its inception. The story of that dream is full of interest because it parallels and bears practically the same dates as the story of the automobile. The dream, the idea of an Arroyo Seco highway gathered strength with the years. Its growth paralleled and matched the growth of the use of automobiles.

I wonder what sort of road Mr. T. D. Allen had in mind when he made the first survey for a road through here 45 years ago, when there could scarcely have been more than a hundred automobiles in the entire country. I wonder what report he made, and what recommendations—if any. Did he have in mind a winding, rustic, tree-shaded road, crossing and recrossing the creek bed which was (and is) dry most of the year? Or did he have his mind on more practical matters—such as a road to develop a string of gravel pits to supply sand and gravel to the builders of a greater and still greater Los Angeles?

Forty-five years between the first survey and today's splendid completion. That is a long time.

But perhaps it is just as well that the dream was a long time in its dreaming. Perhaps it is just as well that many obstacles stood in path to its final realization. haps it is just as well that dream had to wait, and wait— until, under the pressure of s necessity, it finally burst out o confining walls of public ind ence, official inertia, selfish o sition, and narrow vision. I just as well because, while conf the dream grew and matured. when that dream was transl into legislation, that legislation well conceived and broad visio And when the engineers were f ly told to go to work, their w ing plans were BOLD and prehensive, and they have give something worth while.

I say BOLD because they just that. They dealt boldly realistically and *EFFECTIV* with a traffic problem that had come almost terrifying in its ency of solution. Now that we it, and it all looks so rather sin so obviously necessary, so wh practical, some there will be will ask, "What is there so won

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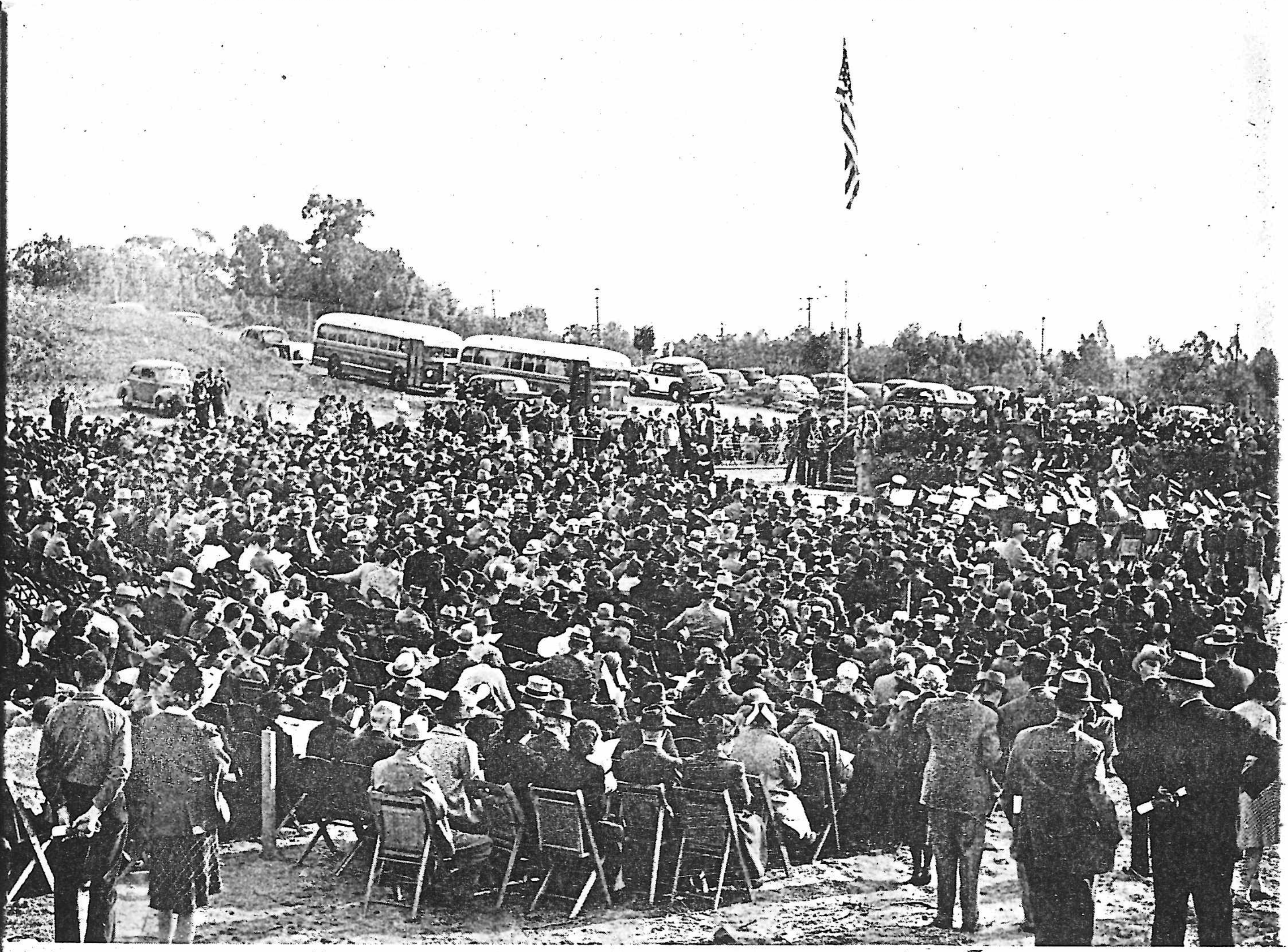
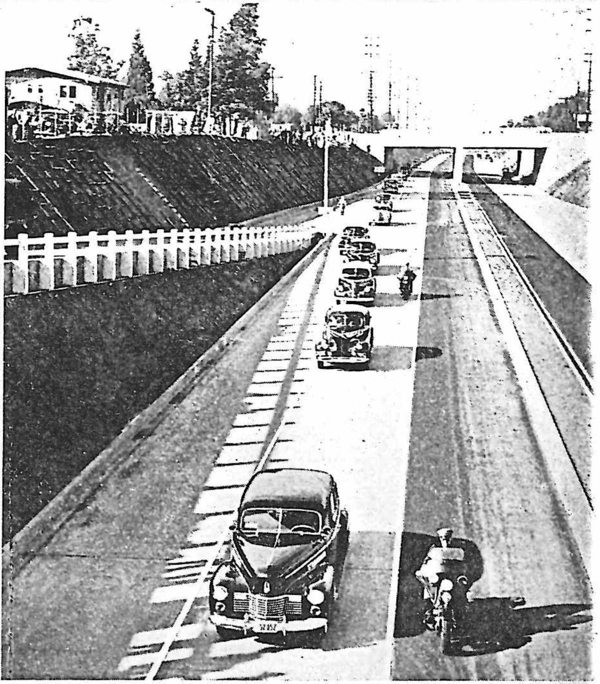
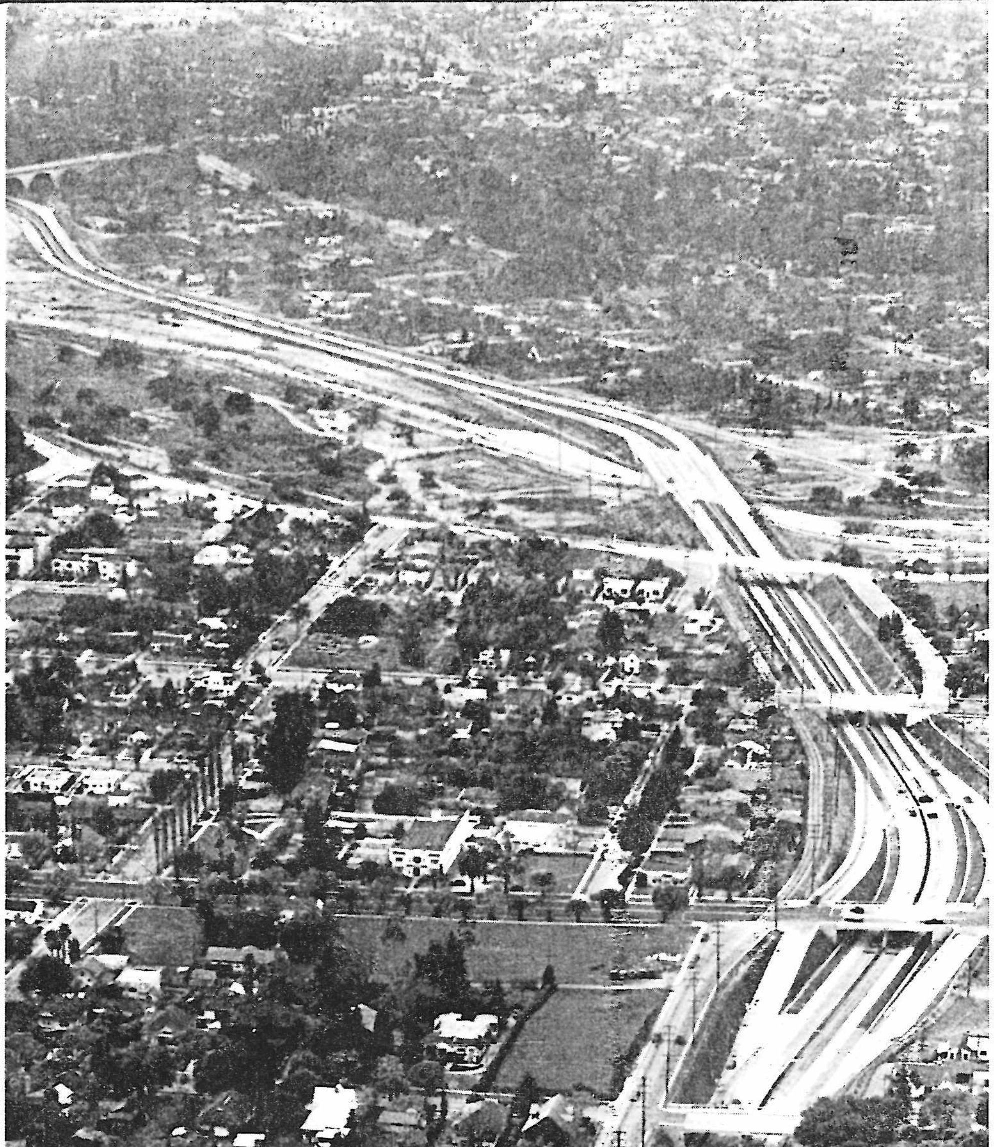




At top—Part of the throng of people who attended the official dedication of the Arroyo Seco Freeway. Below, at left, automobiles oved to and from the dedication scene in six lanes demonstrating the facilities of the divided parkway for accommodating a avy flow of traffic. Lower right—Governor Culbert L. Olson's car leads the long procession to the site of the official opening remonies on December 30th



View of Arroyo Seco Freeway looking toward Pasadena showing 5 of 26 bridge structures

ful, or so bold about it?" Oh ye
but it takes courage to do a th
the FIRST time, no matter h
necessary, no matter how sim
and obvious it may appear AFT
it is done. And *this,* fellow citiz
is the *first* Freeway in the West

HONOR TO ENGINEERS

In dedicating this Freeway,
do honor to the engineers (civil
gineers, safety engineers, lands
architects, and human engine
whose imagination, knowledge,
and genius for organization and
operation were poured into the
ception, planning and executio
this great work. They built
freeway, using steel and conc
But to these materials they ad
those indispensable ingredients
parted only by the mind; nam
adequacy, safety, economy
sheer beauty.

They built adequacy into
Freeway. It will take good
of the heavy traffic it will
to carry—for many years to co

They built SAFETY into
Freeway. Safety, but at the s
time ease, comfort and great sp
for the thousands of motorists
will pass this way every day. S
ty for the children who live
play in the neighborhoods thro
which the freeway passes.
peace of mind for their pare
This one ingredient, alone, is pr
less and would justify the en
cost of the project, because we h
only to capitalize the expense, p
tears and deaths which would
sult from the accidents which
be avoided by the use of this F
way.

AN ECONOMICAL UTILITY

They exercised economy in
use and disposition of materials
economy which has served to
the cost of the project well be
its utility value to the commu
This utility value is measured
only by the accidents averted
also by the direct savings real
by the motorists, in terms of t
jangled nerves, gas and oil,
general wear and tear.

Use of the Freeway will
neighborhood streets and bo
vards from the congestion of he
through traffic, with correspond
improvement of the parking p
lem, greater quiet for the h
owner, greater safety for the ne
borhood and profit for the l
merchant.

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And lastly, our engineers and
hnicians have invested the Ar-
o Seco Parkway with *beauty* as
ll as adequacy, safety and econ-
y. Of course, beauty is only
him who has the eye to behold.
t I ask you to look again, and
ain at the very curves in this
adway. They are designed strict-
for functional and utilitarian
rposes, and banked for safety.
ey of course delight the engineer,
safety man, the road builder,
e motor car manufacturer and the
torist himself, but they also de-
ht the eye of the artist.

BEAUTIFUL VISTAS PRESERVED

Already we see proof of the care-
l planning for roadside beautifica-
n. Grass, flowers, shrubs and
es will soon cover bare banks and
lsides, line the parkway, and
sk the harsh lines of man's so-
led improvements to the land-
pe. When they have grown to
turity, the experience of driving
rough Arroyo Seco Parkway
ll be filled with the pleasure of
eath-taking scenery, with a new
d beautiful vista opening at each
rve of the road.

Let us, by all means, preserve
ose vistas by holding them free
om commercial advertising signs.
am happy to know that the WPA
s set aside $300,000 for a state-
onsored project for the further
autification of the Arroyo Seco.

I said, a few minutes ago, that
is is the first Freeway in the West.
is ONLY the first. And THAT
its great promise to the future—
e promise of many more free-
ys to come.

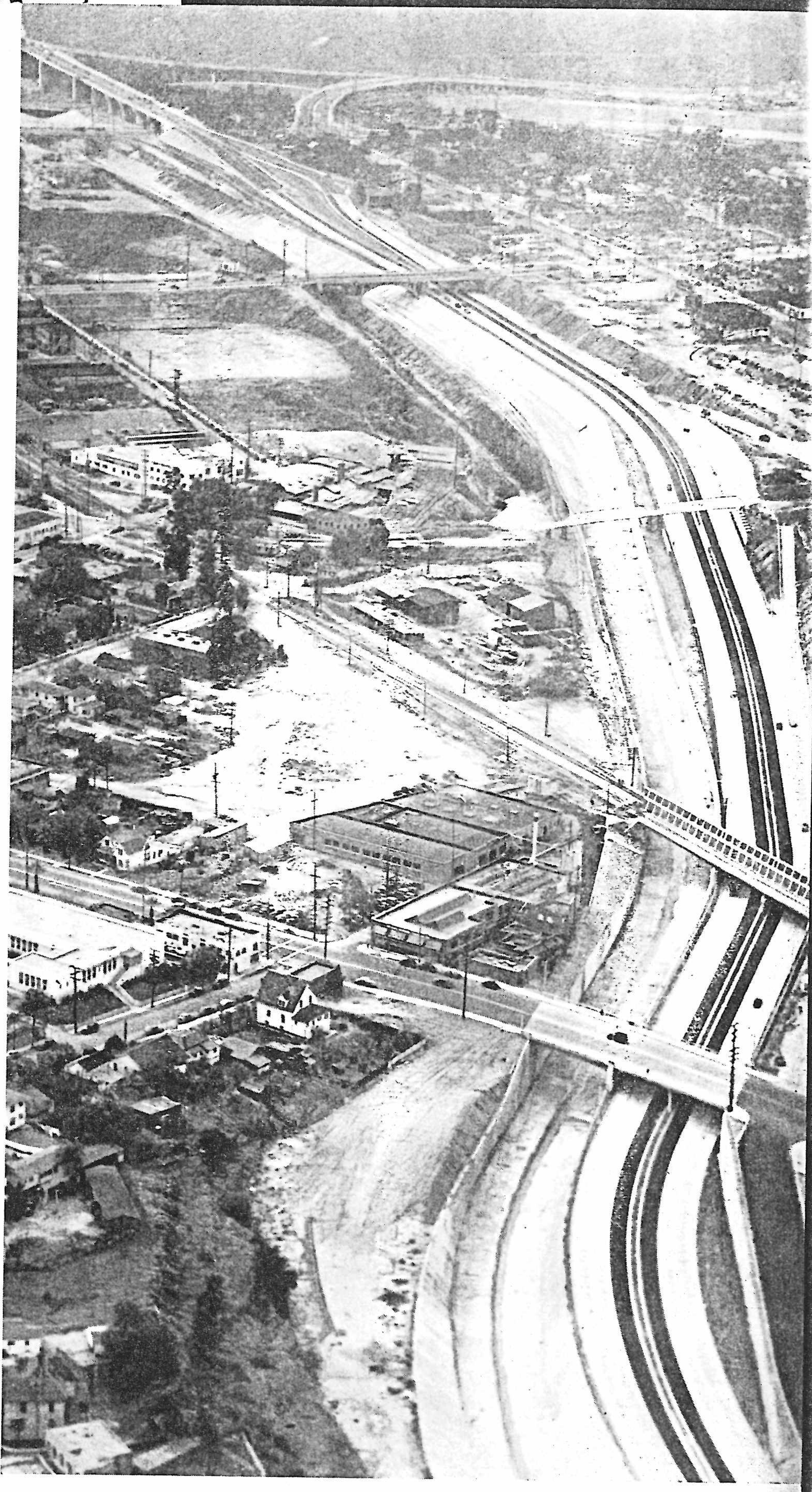
Very soon, this one will be ex-
nded 3 more miles closer to the
art of metropolitan Los Angeles,
th direct access to the Civic Cen-
r by way of Figueroa Street, and
Sunset Boulevard.

MANY MORE FREEWAYS

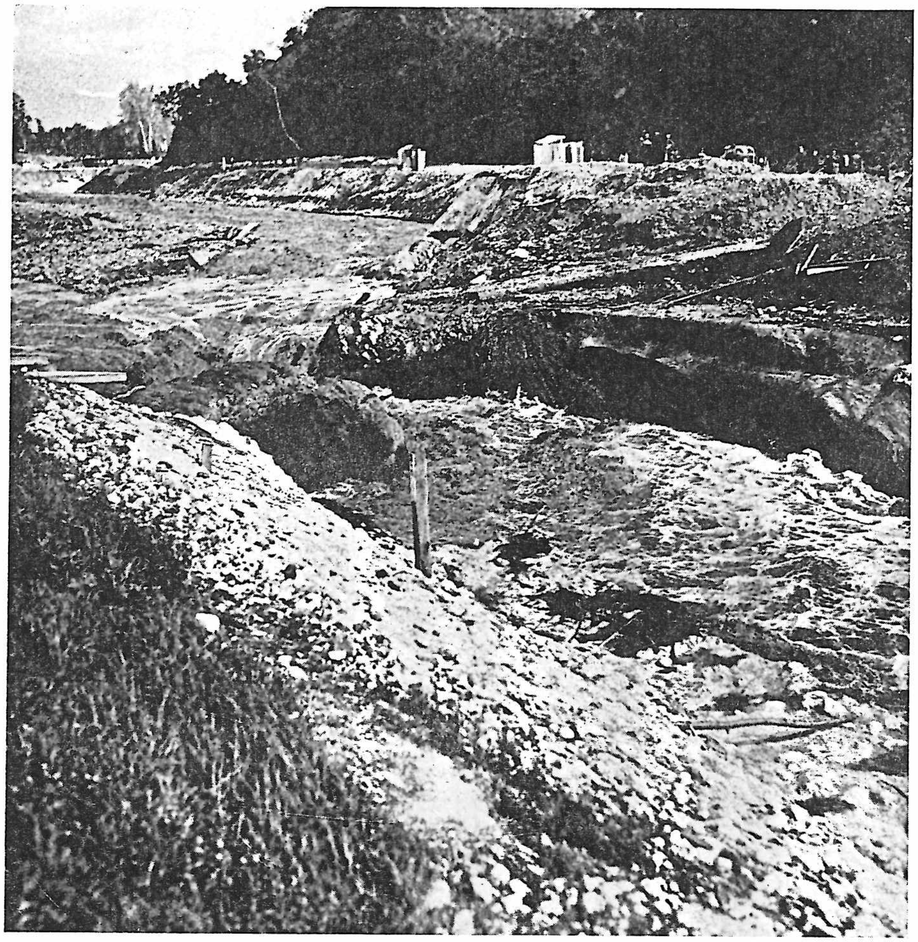
Very soon the Cahuenga Freeway
ll be completed, eliminating the
st serious strictures upon fast,
fe passage between Hollywood
d San Fernando Valley and
ints north.

Work is going forward rapidly
the great Olympic Boulevard
oject leading from Los Angeles'
mmercial center westerly to
nta Monica.

And in the San Francisco Bay
strict, definite plans are now in
eparation to convert the Bay



Arroyo Seco Freeway looking toward Los Angeles. Note paved channel on left



Arroyo Seco in flood period before construction of paved control channel

Shore Highway into a Freeway from Palo Alto to San Francisco. And a similar undertaking is planned between San Jose and Oakland.

There is another feature about this Parkway that appeals strongly to me. It is this. Here is a great public work, unquestionably necessary, practical, and beneficial, but of great magnitude and cost. It stands as convincing proof that government can do things, practical and necessary things, and that it can do them in a businesslike and efficient manner.

ASSEMBLYWOMAN MILLER PRAISED

I have seen the printed pamphlet describing this Freeway. On the last inside page tribute is paid to the many men and women and organizations whose direct labors and cooperation spelled out the great and successful work we here dedicate. I wish to add thereto my own tribute.

I wish, also to tender praise to Assemblywoman Eleanor Miller
who introduced and secured pa
of the legislation enabling the
struction of the Arroyo Seco
way. I am proud of my own
port of this legislation.

Finally, I wish to say tha
people of California are happ
grateful for having a bene
National Government which pa
major portion of the money co
this project.

And now, in the name of
people and the State of Califo
I hereby accept for them the
royo Seco Parkway and dedica
to the general service and safe
the community.

TOO ILL TO APPEAR

It was regrettable that illness
vented the appearance of Dr.
Hewes, Chief of the Western Re
of the U. S. Public Roads Adm
tration, without the assistance
which agency the parkway could
have been built. Dr. Hewes was
resented by C. H. Sweetser.

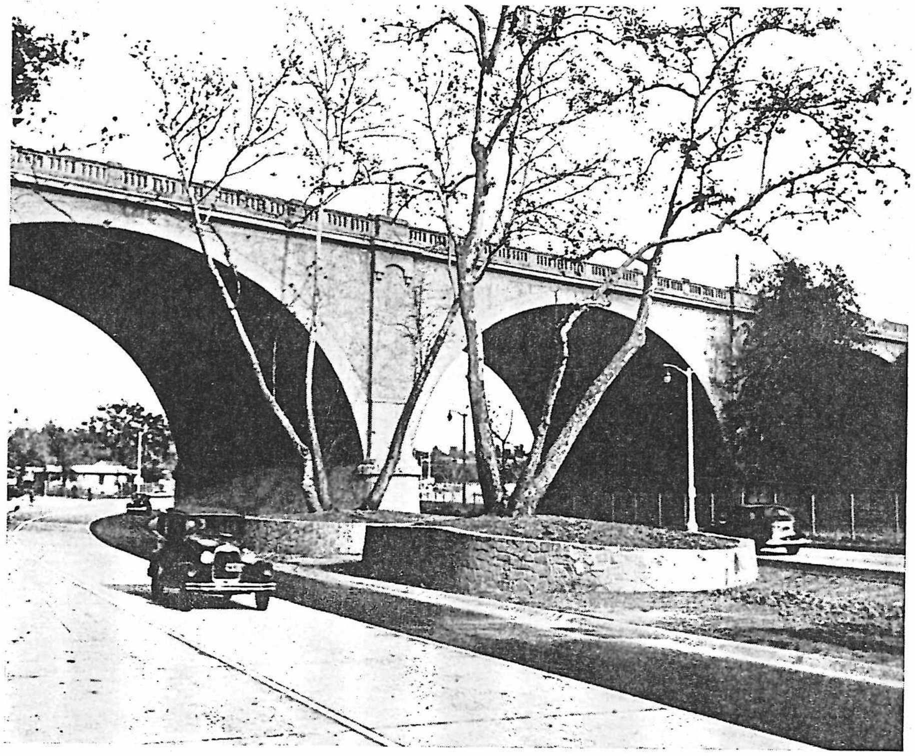
With Frank C. Balfour of
Division of Highways acting as
ter of ceremonies, the progran
speeches was opened by an inv
tion delivered by Rt. Rev. Bert
Stevens, B. D., Bishop of Los
geles. Mayor Andrew O. Porte
the City of South Pasadena gav

(Continued on page 20)

Director of Public Works Frank W. Clark smoking peace pipe with Kawie Indian Ch

Gov. Olson Dedicates and Opens Arroyo Seco Freew

(Continued from page 8)



Great care was taken to protect natural sycamores with masonry retaining walls

address of welcome. He was followed by Albert I. Stewart, Vice Chairman of the Board of Directors of the City of Pasadena and by Mayor Fletcher Bowron of the City of Los Angeles.

A narration of the history of the Arroyo Seco dating back to 1769, when Father Juan Crespi, Franciscan padre with the Portola expedition, first came upon the Arroyo, was recited by Balfour.

Short talks were made by Wright L. Felt, representing P.W.A.; Clayton E. Criggs, representing W.P.A.; S. V. Cortelyou, District Highway Engineer of Los Angeles, under whose supervision the parkway was constructed; State Highway Engineer C. H. Purcell; Larry Barrett, Chairman, and L. G. Hitchcock, member, of the California Highway Commission, and Director of Public Works Clark.

Representing the Army on the speakers' stand were Major General Jacob E. Fickel, Commander of the Southwest Air District, Army Air Corps, at March Field; Col. Allen Kimberly, Commander at Fort MacArthur; and Major H. Bunting, representing General E. Calladay, Commander of the anti-aircraft forces in the district embracing Texas, Arizona, New Mexico, California and Nevada.

ARMY PARTICIPATES

"The Army wants good roads," General Fickel said. "Their use would be imperative in times of emergency. This is such a road."

Army participation included a concert on the steps of the Los Angeles city hall prior to the start of the parade by the Third Coast Artillery Band, which headed the caravan, and the raising of the Stars and Stripes at the dedication site by a color guard from this unit. Selections were rendered by the Pasadena Junior College Bulldog Band while the crowd awaited the arrival of the caravan at Fair Oaks Avenue in South Pasadena.

Translated literally, Arroyo Seco means "Dry Wash." For many years before and after the coming of the white man to California, the Arroyo during the rainy season
ried flood torrents to the sea.
order to build the parkway, this fl
menace had to be controlled, and
this end the Arroyo Seco Flood C
trol Channel, extending from Dev
Gate Dam in Pasadena to the
Angeles River in Los Angeles c
a distance of 10.5 miles, was c
structed by the W.P.A. at a Fede
cost of $7,000,000 plus $880,000 fr
four sponsors, the State Division
Highways and the cities of
Angeles, Pasadena and South Pa
dena.

WILL CARRRY PEAK FLOOD

The channel is now prepared
carry a peak flow in flood times
13,500,000 gallons of water per mi
ute to the Los Angeles River, a pe
capacity twenty times that of
Metropolitan Water District aq
duct. Millions of yards of ear
were excavated from the Arroyo Se
in the building of the channel, wh
is designed to confine the waters
the drainage area in a lined chann
along the parkway.

Public spirited citizens and ci
organizations played an importa
part in bringing about the Arro
Seco Parkway. In addition to o
own Division of Highway enginee
tribute for their untiring efforts
making possible the West's first mo
ern freeway should fittingly be pa
to City Engineer Harvey Hincks
Pasadena and his assistants for the
co-operation and early plans for t
parkway in Pasadena and Sou
Pasadena; to Frank Clough, Ci
Engineer of South Pasadena; to Ci
Engineer Lloyd Aldrich of Los A
geles and his deputies, Merrill Bu
ler, L. E. Arnold, C. J. Shults, L.
Armstrong, C. L. Bell, and R.
Stewart for preparation of intrica
plans in co-operation with State eng
neers, and for Engineer Aldrich
efforts in securing large Feder
allotments for the Arroyo Chann

FEDERAL GOVERNMENT AID

To Dr. L. I. Hewes and C.
Sweetser of the U. S. Public Roa
Administration; to Wright L. Fe
of the P.W.A. and to R. D. Spence
and Bernard Sewell of the W.P.
representing the Federal governme

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ithout whose aid the parkway never ould have been completed.

To the park superintendents and ommissioners of the three cities for heir aid in beautification and right f way.

To the Santa Fe and Union Pacific Railroads for changing facilities on heir private rights of way to fit in ith the parkway, thus effecting substantial savings in the parkway construction.

To the spirit of cooperation evidenced by the many contractors and heir employees whose willingness to id enabled the project to advance vell ahead of schedule.

THANKS TO ASSISTANTS

It was my honor to act as chairman of the Arroyo Seco Parkway Dedication Committee, which made arrangements for the ceremonies attendant upon the opening of the parkway and I wish to take this opportunity to express my appreciation of the assistance given to me by the following committee chairmen: Caravan and decorations, Stephen W. Cunningham, City Councilman, Los Angeles; Publicity, Harrison R. Baker, Arroyo Seco Parkway Ass'n, Pasadena; Policing, E. Raymond Cato, Chief, California Highway Patrol; Dedication ceremonies, Andrew O. Porter, Mayor of South Pasadena; Dedication luncheon, Edward S. Graham, Chairman, Arroyo Seco Parkway Ass'n, Pasadena; Finance, T. J. Haddock, President, J. E. Haddock Co., Ltd., Pasadena.

No Other Like It

Redding, California

Department of Public Works,
Public Works Building,
Sacramento, California.

Dear Sirs:

I'm writing this note to ask you to please change my mailing address from Lodi, Calif., to the one as given above.

I certainly enjoy getting your magazine and think that there is no other magazine on the market that gives so much information per page. It certainly is informative as to what is going on in the Division of Highways and the Department of Public Works.

Thank you for your service in the past. I hope that it will continue in the future.

Sincerely yours,

James F. Culbertson

Timid Frosh: "I could sit and look at you forever."

Gal Co-ed: "That's what I'm starting to think."

Department History In The Next Issue

The history of the State Department of Public Works together with a comprehensive description of the activities of this largest agency of our State government will be presented in the next issue of this magazine. The work of its three component divisions, namely, the Division of Highways, Division of Water Resources and Division of Architecture touches, very intimately, on numerous occasions during the year, the life and interests of every citizen of California.

The growth of the department from the office of State Engineer with a comparatively few employees in 1878 to its present status with 6,000 employees some of whom are located in every city and county of the State is a striking result of the march of time in California.

Non-Highway Use of Motor Fuel More than 10 per cent

More than one-tenth of the 23,000,000,000 gallons of motor fuel consumed in the United States in 1939 was not used on the highways, but in dozens of other gasoline-motor installations, a report of the Public Roads Administration reveals.

This non-highway use, which includes aviation, agriculture, motor boats, other gasoline engines of all kinds, construction machinery, cleaning, and scores of other uses, as well as the unavoidable losses the petroleum industry suffers from evaporation and handling, amounted to more than 2,000,000,000 in 1939.

Of the nearly 21,000,000,000 gallons used in motor vehicles on the highways, the report shows, private and commercial motorists consume 97.4 per cent, and public use in vehicles of Federal, State, county, and municipal governments, 2.6 per cent.

Eliminating 2-Lane Coast Link

(Continued from page 10)

the sand off the bluff to construct a ramp road on a 20 per cent grade to the top. After the road was completed a two yard power shovel was moved to the bench on the bluff and the removal of the sand was then comparatively easy.

While the sand did not give trouble, the drilling and blasting of the volcanic breccia overburden was difficult. Large charges of powder had to be used to shatter the overburden to prevent it overhanging the shovel. The volcanic breccia when finely shattered made excellent subgrade material.

The portion of the contract on the easterly end, including Railroad Slide, provided for grading only. Of the balance of the contract, substantially all of the paving operations are completed, structures built and dividing curb in place. Shoulders, planting, finishing, etc., and the Railroad Slide area remain.

Completion of the work will bring the Roosevelt Highway another step nearer modern standards.

This work is being financed with Federal Aid and is being carried on under the immediate supervision of C. N. Ainley, Resident Engineer, A. N. George, District Construction Engineer, and S. V. Cortelyou, District Engineer.

A. R. B. A. Convention

"Roads for Defense" will theme note the 1941 Convention of the American Road Builders' Association. Outstanding military authorities and representatives of the U. S. War Department will participate in an open forum on military roads during the four-day conclave in New York City, January 27-30.

Courses for Public Employees

Evening classes of special interest to engineers offered by the Civic Center Division of The University of Southern California School of Government include: Stresses in Framed Structures; Reinforced Concrete; Statically Indeterminate Structures; and Sanitation and Purification of Water, as well as various electrical and mechanical engineering courses.

Extending Arroyo Seco Parkway Into Los Angeles Business Center

By JOHN G. MEYER, Assistant Office Engineer

FINANCED as a cooperative project by the Federal Government, the State of California and the City of Los Angeles, the work of extending the Arroyo Seco Freeway through Elysian Park southerly on Figueroa Street from Avenue 22 to Adobe Street in downtown Los Angeles is now under way.

The extension is necessary to relieve traffic congestion across the Los Angeles River Bridge, through the Riverside Drive intersection and in the four Elysian Park tunnels which has greatly increased since the completion of the Arroyo Seco Freeway.

Approximately $2,437,000 of WPA, Federal Aid, State Highway and City of Los Angeles funds will be expended on the improvement.

The general plan for the extension calls for the use of the four existing Figueroa Street tunnels through Elysian Park and the roadway and bridge over the Los Angeles River between Castelar Street and Avenue 22 for northbound traffic only; construction of a four-lane roadway for southbound traffic through open cuts in Elysian Park on the westerly side of the existing tunnels and at a higher elevation to facilitate grade separations for traffic at Solano Avenue, Bishops Road and at Castelar Street; construction of an additional four-lane bridge for southbound traffic, across the Los Angeles River upstream from the existing bridge, but at a higher level. The grade of the southerly end of this bridge will be above Riverside Drive to permit northbound Riverside Drive traffic to turn left under the new bridge.

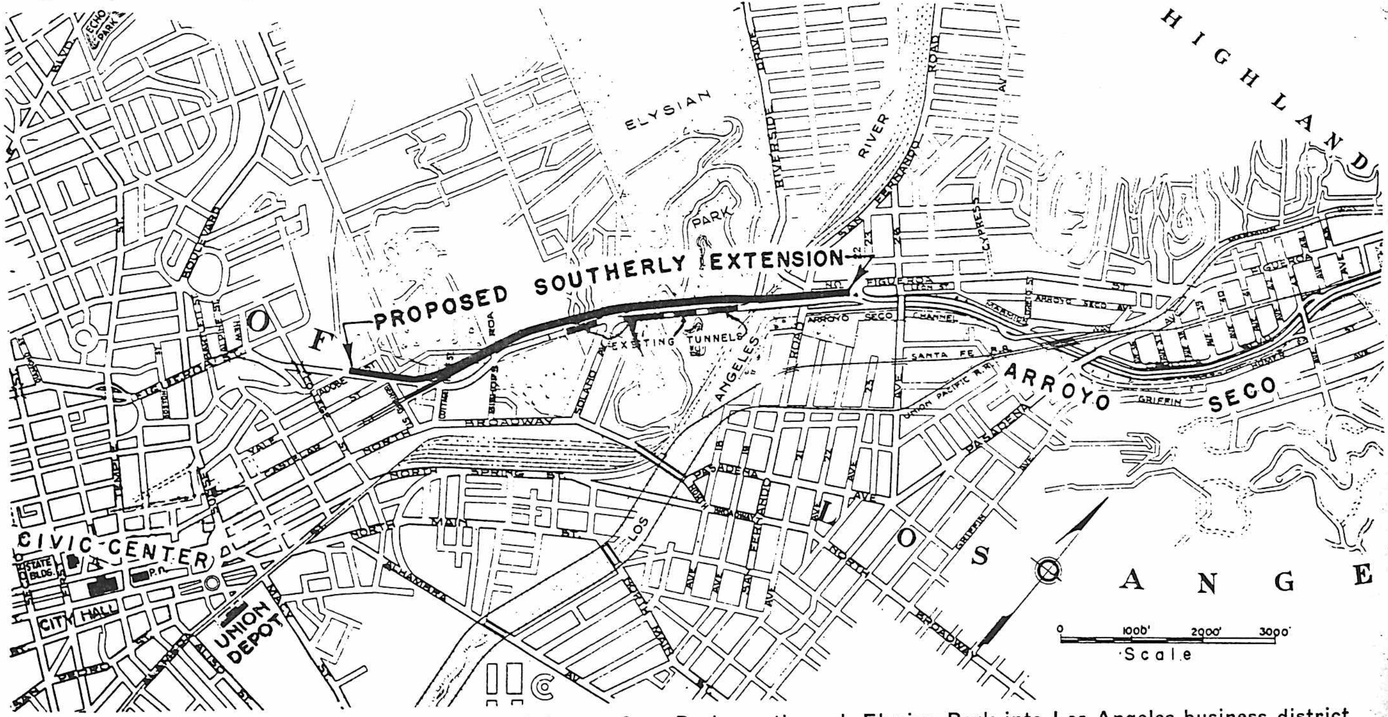
The new work on Figueroa Street from Avenue 22 to Adobe Street will be on a freeway basis.

The WPA is engaged at present in grading operations and the building of the substructures of the Los Angeles River and Solano Avenue bridges.

Contracts have been advertised for the Castelar Bridge to cost about $65,000. Bids for the Park Row Bridge to cost $30,000 were opened on April 3d. Bids will shortly be taken for the Bishop Road and Amador Street bridges and for the Los Angeles River and Solano Avenue bridge superstructures.

The grading work involves the excavation of 550,000 cubic yards of earth and rock requiring 20,000,000 station yards of overhaul. A considerable portion or about 400,000 cubic yards of excavation is not required in the fills and is to be used in filling some of the Elysian Park Canyon areas which will assist in the beautification and development of that park.

(Continued on page 24)



Map showing proposed southerly extension of Arroyo Seco Parkway through Elysian Park into Los Angeles business district

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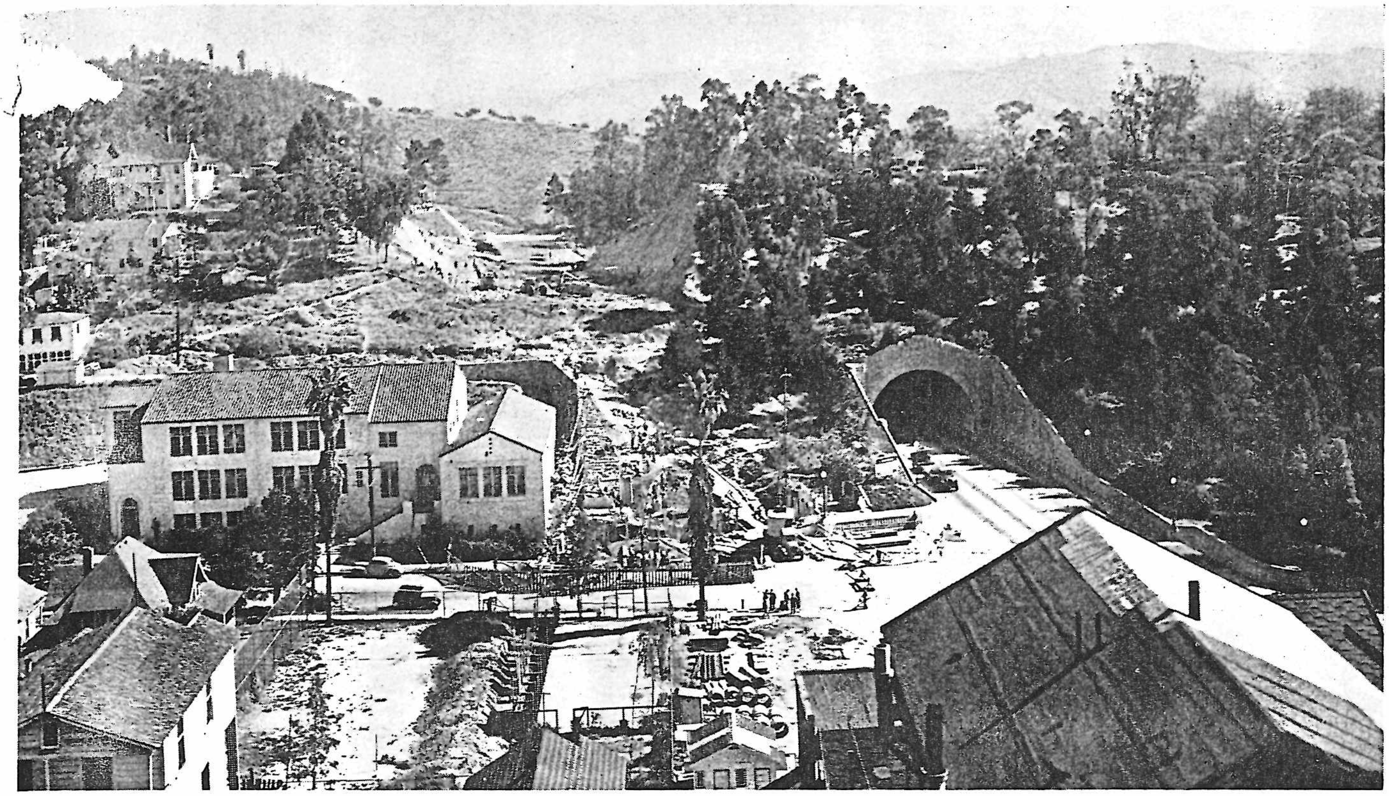
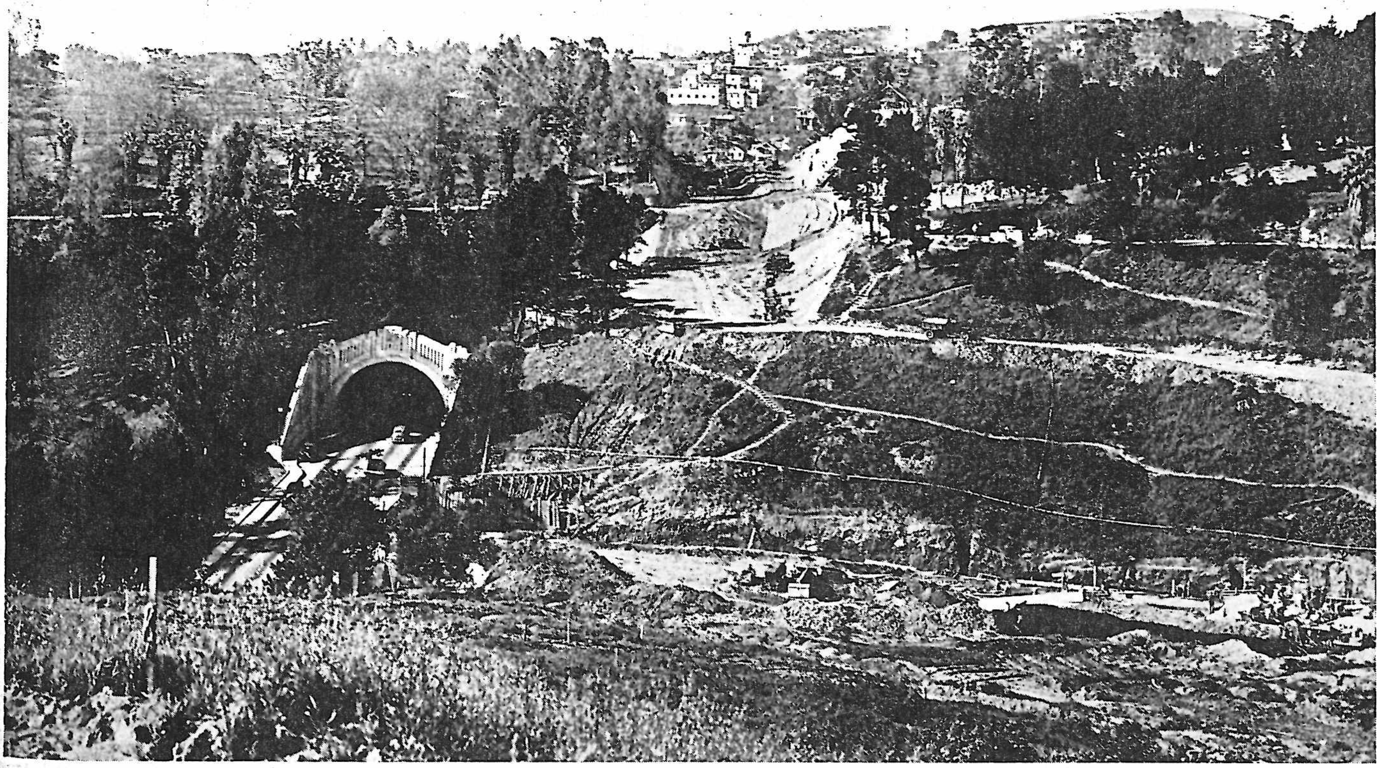


View of open cut under construction through Elysian Park in Los Angeles for southbound traffic extension of Arroyo Seco Freeway



Open cut construction parallels existing Figueroa Street tunnels for northbound traffic seen at left. Large fill will be built in foreground

Extending Arroyo Seco Parkway Into Los Angeles

(Continued from page 8)

Earth cuts 100 feet or more in height are involved on this project. The balancing of cuts and fills was not possible because of the topographical and geological grade controls to be met.

Incidental to the highway work is the reconstruction and enlargement of the Elysian Reservoir operated by the Los Angeles City Department of Water and Power. The highway in this area will be on the downstream toe side of the dam and will be part of the earth dam structure. This work with lining and appurtenances will cost about $217,000 of WPA and city funds.

The project will provide a comprehensive plan of landscaping to be cooperatively financed by the City of Los Angeles Park Department, the WPA and the State. This will result in the complete development of the park lands adjacent to and visible from the freeway.

Approximate estimates of construction costs of various units showing the construction agency follow:

L. A. River, Substructure	$270,000	WPA, State, City
L. A. River Superstructure	400,000	Contract—Federal Aid, State
Castelar St. Separation	65,000	Contract—Federal Aid, State
Amador Street, Separation	25,000	Contract—Federal Aid, State
Bishop Road Separation	60,000	Contract—Federal Aid, State
Park Row Separation	30,000	Contract—Federal Aid, State
Solano Street Separation Substructure	25,000	WPA
Solano Street Separation Superstructure	30,000	Contract—Federal Aid, State
Grading, paving and landscaping	1,315,000	WPA
Elysian Reservoir Enlargement	217,000	WPA
	$2,437,000	

The substructure of the Los Angeles River bridge is being constructed by WPA at an estimated cost of $270,000. Work on the smaller piers is now in progress. As soon as flood danger is over work will start on the two large river piers. The removal of existing heavily reinforced concrete channel walls to permit the construction of the foundations of the river piers will be a difficult operation. Although these piers will not be ready for placing the deck until about November, 1941, other piers will be ready for the superstructure about July, 1941.

This bridge should be finished about the summer of 1942 which should coincide with the completion of the roadway grading, paving and landscaping. In other words the Extension may be opened to traffic in the summer of 1942.

If a Bridge Could Speak

Mr. W. A. Macdonald, publicity representative of the Government Travel Bureau of British Columbia, attended the dedications of the Eel River and Smith River State highway bridges. Impressed by the grandeur of the redwoods in Humboldt and Del Norte counties and the new spans of modern structural design he wrote the following for California Highways and Public Works:

I am a bridge.

I am made of steel and concrete.

Because I am a new bridge I am made of the finest materials and the utmost design that marks modern engineering achievement.

I am built for beauty that the greater beauties of nature may be more fully enjoyed.

I am built for safety in order that your enjoyment may not be marred through any fault of mine.

I permit easier access between communities and thus promote the spirit of neighborliness.

I am a bridge—a new bridge—a fine bridge.

I am a symbol.

My structure and design are symbols of American progress.

I am a symbol of man's appreciation of beautiful things, both in the things of his own creation and in God's handiwork in Nature.

I am a symbol of man's awareness of the dangers that beset his brothers—a symbol of man's efforts to lessen those dangers.

When men meet in the center of my span, far above the rushing torrent, and when they clasp hands in friendship and understanding, they may know that the great human heart of true Americans can always rise above and conquer threatening force, for I am a symbol of the greater power of a people united for the common good.

The giant redwood trees whisper in their spiring antiquity. They look down from their ages of possession upon our brief stewardship of this great land. They look down upon me—a new bridge—and upon you, the guardians of this great land. They see in me, not just a structure of steel and concrete, but a symbol of things which will endure, even as they have endured. And may it be said that they see in you those qualities of loyalty, integrity, and unity that will overcome all obstacles in assuring the great destiny of the land that bore them.

I am a bridge.
I am a symbol.

Highway Crews Win High Praise for Storm Work

"TOO much praise can not be given the members of the State Highway Division's maintenance crews—at least in this part of the State, and they probably are representative of the entire force—for their splendid fight against the elements in the recent period of flood," says the Santa Maria Times.

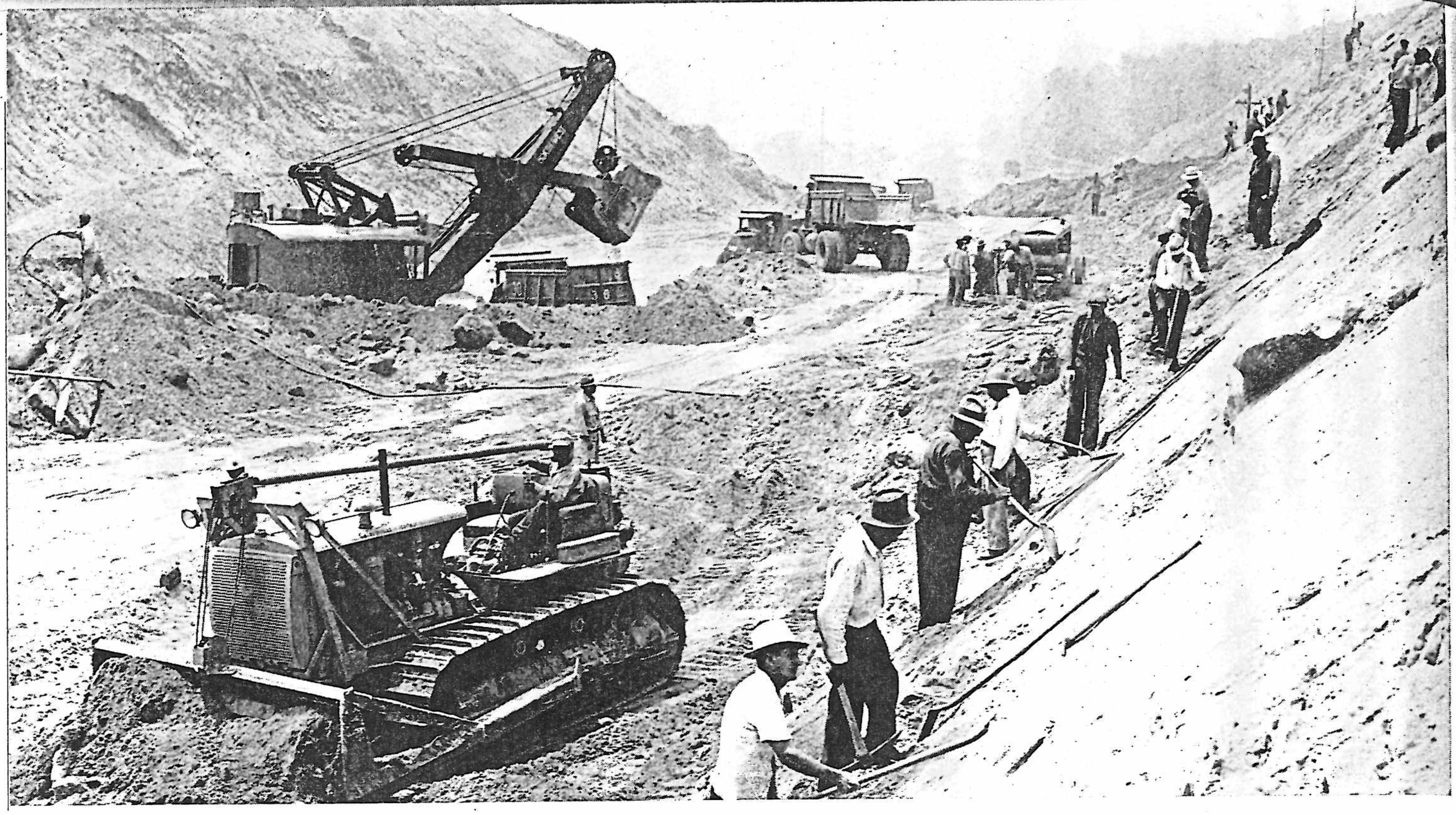
"No matter how hard the rain was falling, travelers found the highway crews at work, day and night. Bulldog machines were pushing huge piles of mud, sand or gravel off the pavements at dangerous points, trucks were hauling the stuff away, where it could not otherwise be disposed of temporarily; flagmen, in slickers and storm hats were directing traffic and warning of danger, signs and flares were rushed out to points where caution in driving was necessary, and work seemed to go on 24 hours out of every 24, smoothly, carefully, efficiently.

"As a result of this, under great odds, Highway 101 was kept open between Santa Maria and Santa Barbara; the same road north of the city was often freed of sand, gravel and slime, and the roadbed was guarded at the Santa Maria bridge against a mounting floodtide in the river, and difficult Cuyama highway was kept open except for a brief period when a bridge approach was washed out.

QUICK WORK RESTORED THIS BRIDGE

"Over the Bakersfield-Fresno road near Cholame, a similar battle was in progress. The highway was under water and mud in many places, but crews kept the mud back so that cars could get through and kept traffic moving through a mountain area until the swirling waters finally cut out the supports and dropped two spans of a concrete structure into the streambed.

"While it was a huge job to install a redwood flume of sufficient size to carry that flood of water and then cover it with earth and gravel, it was not a week, until the by-pass had been finished in pouring rain."



Big power shovels, tractors, bulldozers, trucks and some of 2,000 men engaged in building Arroyo Seco extension through Elysian Park

Arroyo Seco Freeway Extension Becomes a $4,000,000 Defense Highway Project

By ROBERT J. HATFIELD, Resident Engineer

CONSTRUCTION of the southerly extension of the Arroyo Seco Parkway, a certified, National Defense, WPA project sponsored by the State, is now in a spectacular stage of construction. This project, which began as a sorely needed civic improvement for the safety, convenience and economy of metropolitan Los Angeles, has now been classed as one of the roads forming a part of the National Strategic System of Roads, as designated by the War Department and entitled to priority in steel and cement materials for its completion.

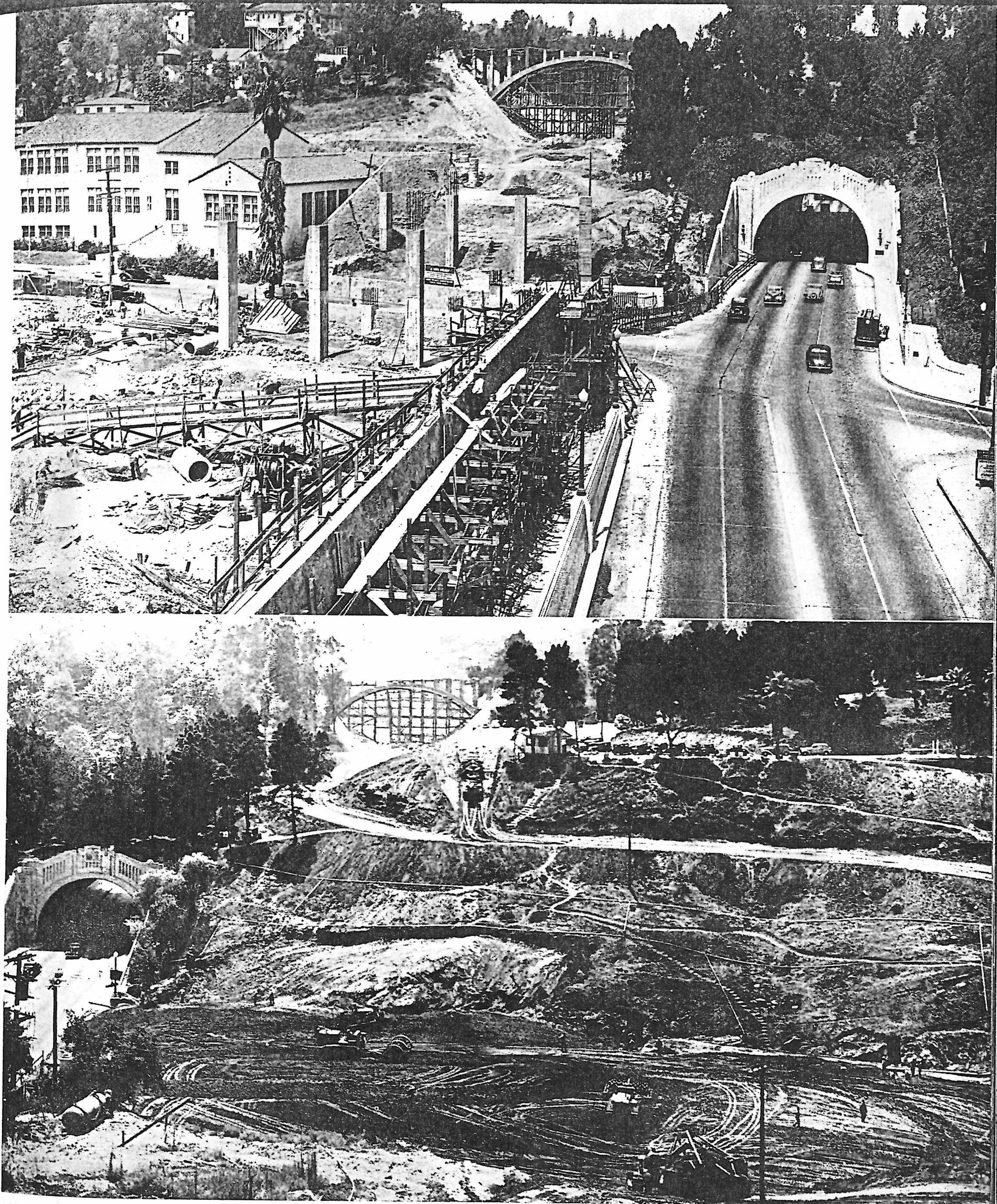
With all the concentration of effort for defense; the achievement of the ultimate safety benefits which will result is in no way curtailed or delayed.

The project was described in the April, 1941, issue of *California Highways and Public Works,* and consists of the construction of a new four-lane roadway paralleling existing Figueroa Street for a distance of approximately 1.8 miles, and extends from the present end of the Arroyo Seco Parkway southerly toward the Los Angeles Civic Center.

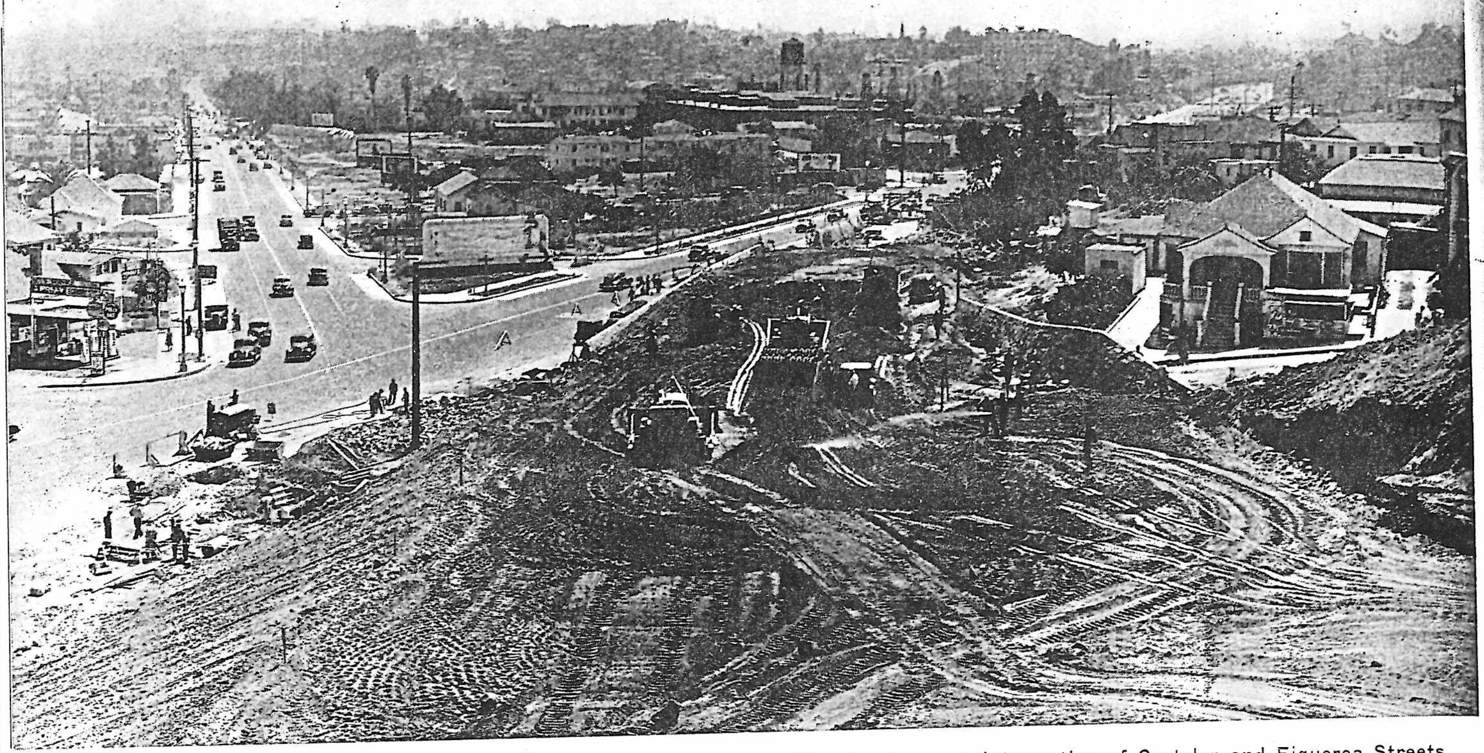
The improvement involves the duplication of the existing $700,000 Los Angeles River Viaduct; the removal of three-quarters of a million cubic yards of rock excavation, paving, storm drains and sanitary sewers, together with five grade separation structures, which are being performed by contract.

At present ten 110-horsepower tractors, equipped with 16 cubic yards capacity carryalls, bulldozers, sheepsfoot tampers or rooters, together with one 2½ cubic yard and one 1½ cubic yard gas shovels, a fleet of 40 dump trucks, nine air compressors, and a half dozen concrete mixers, are operating during the day and continuing operations under flood lights during the night. All available space is now occupied with equipment or squads of workmen, who total 2,000 on the job. Rock cuts, which are in the very heart of Los Angeles, are being blasted, and material removed. Storm drains are being installed; bridges are being built, and rubble walls, of greater size than ever before seen in this area, are rapidly nearing completion.

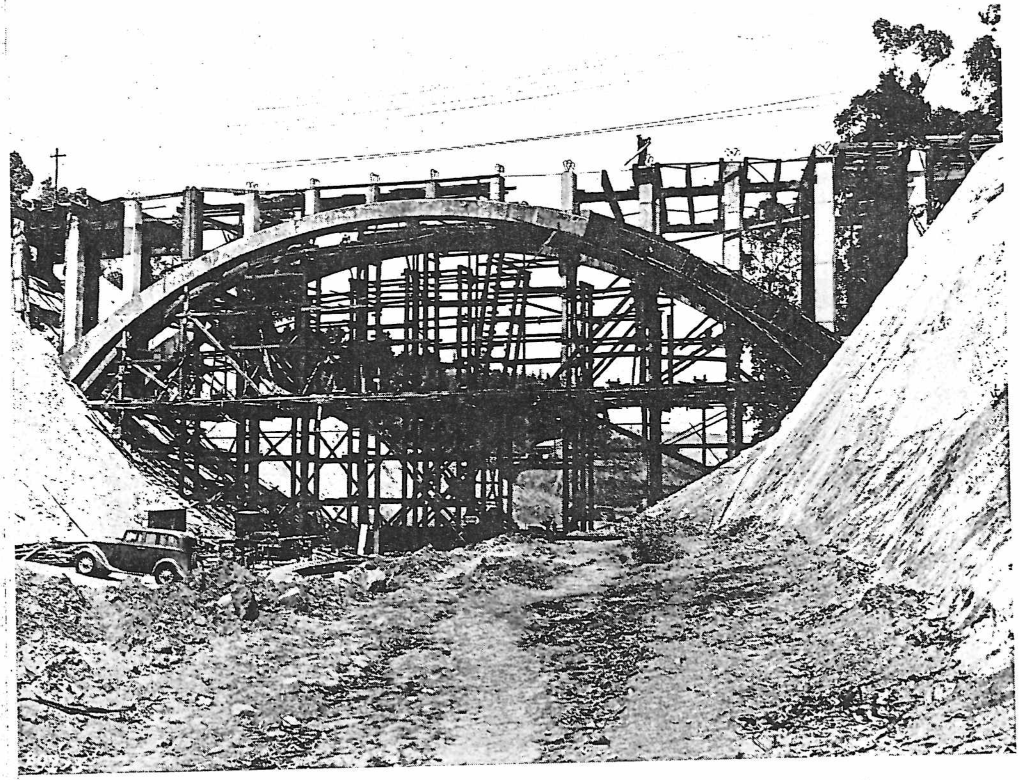
The rubble walls are particularly worthy of special comment. Thirty thousand cubic yards of broken and discarded concrete sidewalks, curbs, gutters and pavement have been and



Top view shows existing Figueroa Street tunnel on right and construction at Solano Street grade separation with Park Lane bridge in background. At bottom—Extensive grading at site of Bishops Road grade separation and construction of dam that will also serve as highway embankment. Excess excavation material is used for dam which permits extension of city-owned reservoir



Extensive grading work and site of two overhead grade separation structures at intersection of Castelar and Figueroa Streets



Close up view of Park Lane grade separation under construction

are being accumulated for the purpose of providing aggregate for the construction of retaining walls, which are not only adding to the beauty of California's first freeway, but are, as well, providing economical substitute for reinforced concrete retaining walls.

Through the cooperative efforts and planning of Los Angeles City Traffic Engineer Ralph T. Dorsey, and the city police force, the 45,000 vehicles which each day are affected by this construction, are finding their homeward and officeward paths little, if any, less convenient as every effort is made to prevent constriction of traffic in spite of the fact that a large amount of construction is constantly changing locations.

The completed project will have all of the safety features that were incorporated in the Arroyo Seco Parkway, and in addition will possess added safety features developed from experience and observation of the conduct of traffic on the Parkway.

FINE OFFICIAL COOPERATION

In the development of the safety features on this project, as well as the other details of design, we are in no small way indebted to City Engineer Lloyd Aldrich, and his deputies —Merrill Butler, Hugo Winter, and Louis Arnold, who have wholeheartedly and unstintingly cooperated in all details connected with the work.

In addition to the benefits to the traveling public and the fulfilling of the important defense demands, the project provides for the enlargement of a city-owned reservoir, by the utilization of excess roadway excavation for the construction of the dam, which will also serve the purpose of a highway embankment.

In keeping with the policy established on the Arroyo Seco Parkway,

(Continued on page 24)

Bids and Awards for the Month of August, 1941

INYO COUNTY—Between Cottonwood Creek and 3.3 miles north, about 3.4 miles to be graded and surfaced with plant-mixed surfacing. District IX, Route 23, Sections J,K. Oswald Bros., Los Angeles, $66,733; A. S. Vinnell Co., Alhambra, $66,741. Contract awarded to Basich Bros., Torrance, $61,740.

KERN AND INYO COUNTIES—Between Freeman and Haiwee, 14.1 miles, applying seal coat on portions. District IX, Route 23, Sections E,H. A. S. Vinnell Co., Alhambra, $13,423. Contract awarded to Basich Bros., Torrance, $11,341.

LASSEN COUNTY—At Fredonyer Summit, about 0.2 mile slide area to be established. District II, Route 29, Section B. Scheumann & Johnson, Eureka, $34,784. Contract awarded to Poulos & McEwen, Sacramento, $32,085.

SANTA CLARA COUNTY—Between 2.1 and 5.5 miles east of Gilroy, about 2.6 miles to be surfaced with gravel base and armor coat. District IV, Route 32, Section A. Contract awarded to Piazza and Huntley, San Jose, $18,412.

SOLANO AND NAPA COUNTIES—Between 0.6 mile and 2.3 miles north of Route 208, about 1.7 miles to be graded and surfaced with Portland cement concrete and asphalt concrete. District X, Route 7, Sections G,A. Contract awarded to Heafey-Moore Co. & Fredrickson & Watson Construction Co., Oakland, $128,157.

SONOMA COUNTY—Between Sheephouse Creek and Duncan Mills, about 2.7 miles to be surfaced with gravel base and armor coat. District IV, Route 104, Section A. Helwig Construction Co., Sebastopol, $15,614; E. A. Forde, San Anselmo, $18,637. Contract awarded to Sheldon Oil Co., Suisun, $13,745.

YUBA AND BUTTE COUNTIES—Between Linda Corners and "D" Street Bridge and between 1.9 miles north of Yuba County line and Union School, about 8.4 miles to be surfaced with plant-mixed surfacing. District III, Routes 3, 87, Sections B,A. Hemstreet & Bell, Marysville, $13,924. Contract awarded to Union Paving Co., San Francisco, $12,725.

YUBA COUNTY—Between Marysville and Hallwood, about 2.3 miles to be surfaced with crusher run base and seal coat applied. District III, Route 15, Section A. Contract awarded to Hemstreet and Bell, Marysville, $16,772.

Jenner Jetty Defies Ocean's Storms

(Continued from page 17)

veys, supervision and inspection costs amounted to $5,782. The remainder of the $65,550 fund provided for construction was used in building timber pile crest wall extending a distance of 1,200 feet landward from the rock and concrete section, and other preparatory work.

State engineers who designed the jetty and supervised its construction included State Engineer Edward Hyatt, the late Deputy State Engineer R. L. Jones, and G. H. Jones, Supervising Hydraulic Engineer. The detailed plans were prepared by Van G. Horton and Max Bookman.

In charge of construction supervision for the State during the contract period were W. G. Schulz, P. E. Stephenson, F. M. Huson and C. O. Schellenger.

Ex Commissioner and Editor Sends His Compliments

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VISALIA TIMES-DELTA
Visalia, California

Editor
California Highways and Public Works
Department of Public Works
P. O. Box 1499
Sacramento, California

Dear Mr. Howe:

As a former member of the California Highway Commission I want to compliment you on the excellent publication which is now being put out by the Department of Public Works under your direction. I look it over and read some of the articles in each issue with interest, for although State highway work is on a very much larger scale than it was in my day, I have never gotten over my interest in better highways in California. * * *

Naturally the Central Valley Water Project is very close to the hearts of the people down this way. I was present at the organization meeting of the first association created in California to raise money to exploit the Marshall plan, which was the forerunner of the Central Valley Water Project.

I assure you if there is anything we can do to assist your organization in any way with publicity of importance to highway and water development in this section of the State you will find us ever ready to cooperate.

Fraternally yours,

CHAS. A. WHITMORE,
Editor.

$4,000,000 Defense Highway Project

(Continued from page 8)

Elysian Park is being developed, recreational areas are being created, and Los Angeles' most beautiful park will be made more accessible and usable to all of its citizens. This splendid public achievement has been made possible by the very fine spirit of cooperation, which has been enjoyed for the past years, between the State Engineers, the Highway Commission, Director of Public Works Frank W. Clark and city officials of Los Angeles, especially with the Board of Park Commissioners, of which Mrs. Fred Watson is president, and with the Works Progress Administration represented by Mr. Russell Amory, Administrator, and his Chief Deputy, Mr. Ray Spencer.

The cost of the project is divided between State Gasoline Tax Funds, money supplied by the Works Progress Administration and the City of Los Angeles. The total cost will be greater than originally contemplated, due to rising prices of materials, equipment and labor. The probable total will be in the neighborhood of $4,000,000.

Of this amount, $1,800,000 will be provided by the State, $1,900,000 by WPA, and $175,000 by the City of Los Angeles, as cosponsor. The estimate includes cost of right of way, parks and engineering.

Importance of Flatter Cut Slopes

(Continued from page 15)

irregularities which are so valuable in their retention of the topsoil. Pulverizing and moistening the topsoil aids materially in placing and retaining it on the slope.

6. If seeding is considered necessary it should be done immediately upon completion of the topsoil blanket before rain or heavy dew can form a crust upon which the seed cannot be retained.

If it is impossible to obtain sufficient topsoil in this manner, imported topsoil must be used. If topsoil is not available humus material in the form of straw or manure may be worked into the slope surface.

Arroyo Seco Parkway Extension Adds Four Southbound Traffic Lanes

By A. N. GEORGE, District Construction Engineer

WHEN the Arroyo Seco Parkway was opened between Avenue 22 in Los Angeles and Glenarm Street in Pasadena on December 30, 1940, work had already been started on a road which was to become the southbound traffic lanes of an extension of this Parkway southerly from Avenue 22 to Adobe Street in Los Angeles.

At the time the Parkway was opened it fed southerly into a four-lane undivided highway which crosses over San Fernando Road, the Los Angeles River and the Southern Pacific Railroad on a viaduct which provided for two lanes of traffic in each direction and through four tunnels under Elysian Park to Adobe Street.

Riverside Drive connected with the road just southerly of the viaduct, making a left turn necessary across southbound traffic at grade. Solano Street made a grade intersection with this road, as did Bishops Road, Cottage Home, Castelar and Bernard Streets.

The year 1941 proved to be a poor year for road construction as by the middle of summer a steel shortage had developed which prevented the steel companies from furnishing the girders for the new viaduct bridge over the Los Angeles River and Riverside Drive. Therefore, the completion of the southbound lanes, which would make it possible to eliminate all of the above mentioned grade intersections, became dependent upon the delivery of these steel girders.

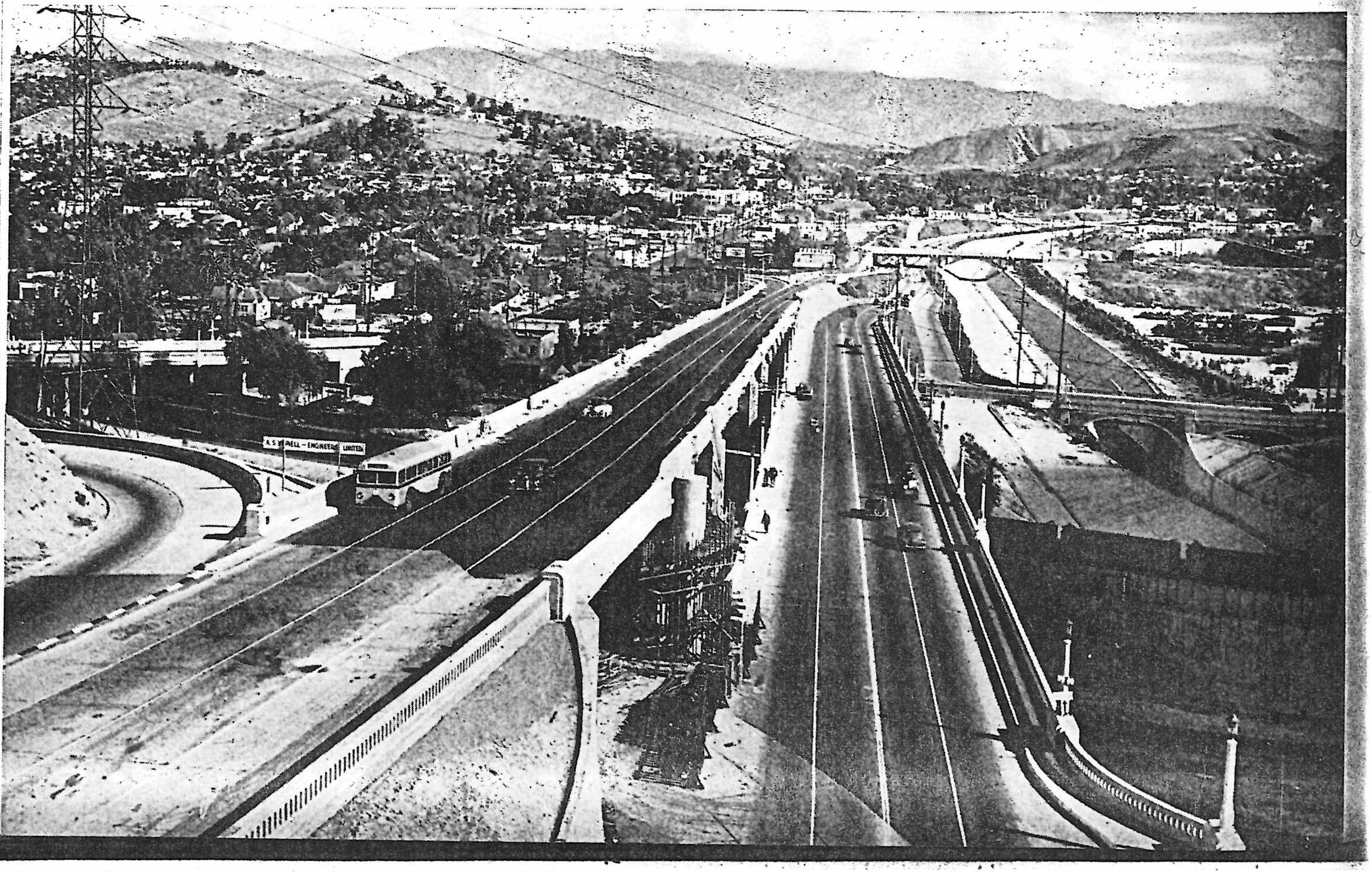
Work on the roadway throughout and on the concrete portions of the new Los Angeles River bridge was carried on during the following years under a WPA project. On December 30, 1942, the WPA project was closed down by the Federal Government, but the major portion of all work necessary to make the highway usable, with the exception of the steel spans of the bridge, had been completed.

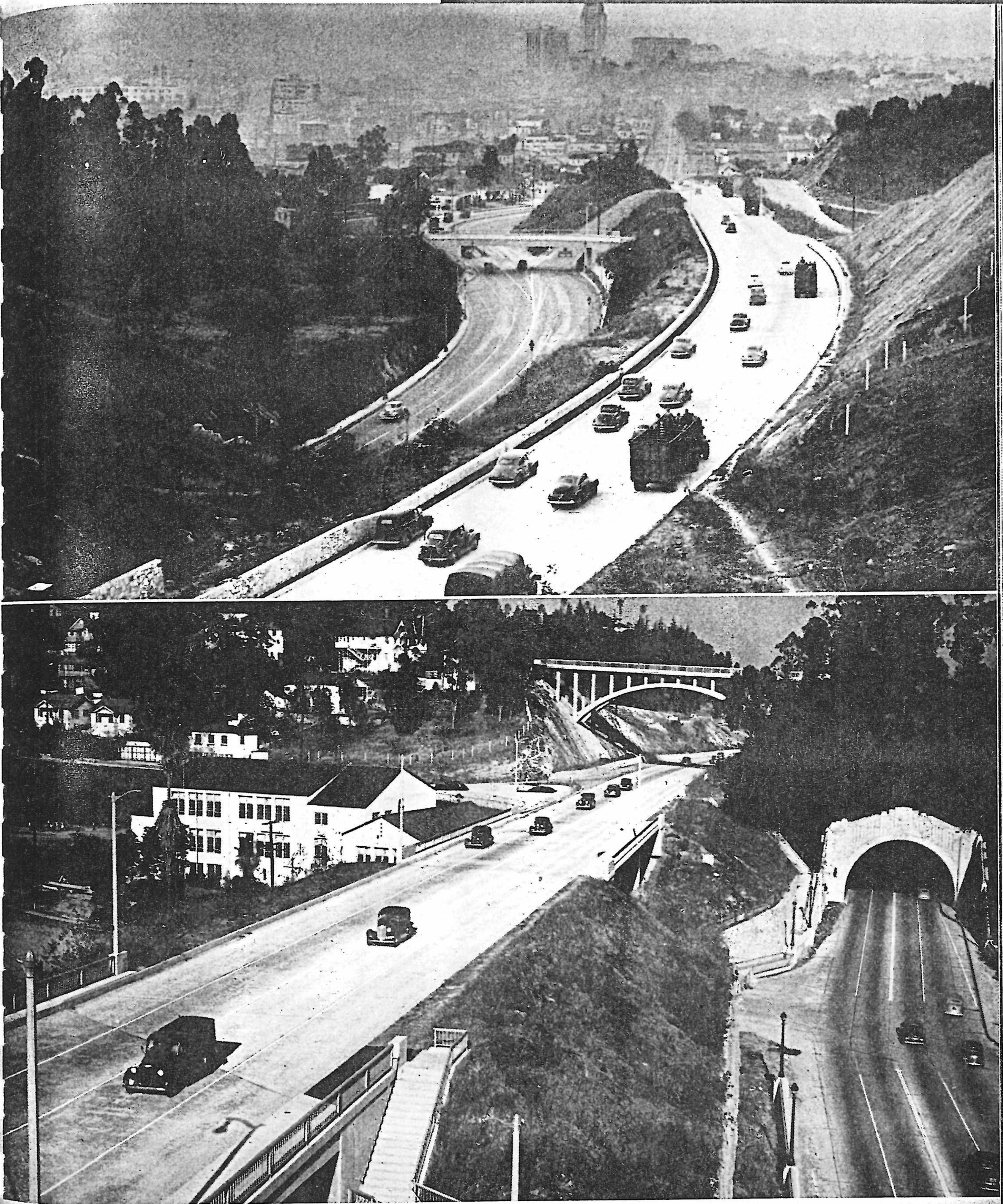
Under the WPA project the piers for the steel structure were constructed and the concrete approach spans, together with all other road work, including curbs and pavement, were completed to Adobe Street. Grade separations at Castelar, Bishops Road, Amador Street, Solano Street, and Park Row were constructed under Bridge Department contracts.

In June, 1943, the Bethlehem Steel Company, who had the contract for the steel superstructure of the Los Angeles River bridge, were able to make delivery and erect the girders. A contract was then awarded to A. S. Vinnell Company and Engineers Limited for the construction of the concrete deck and railing of the river bridge and certain work on the approaches.

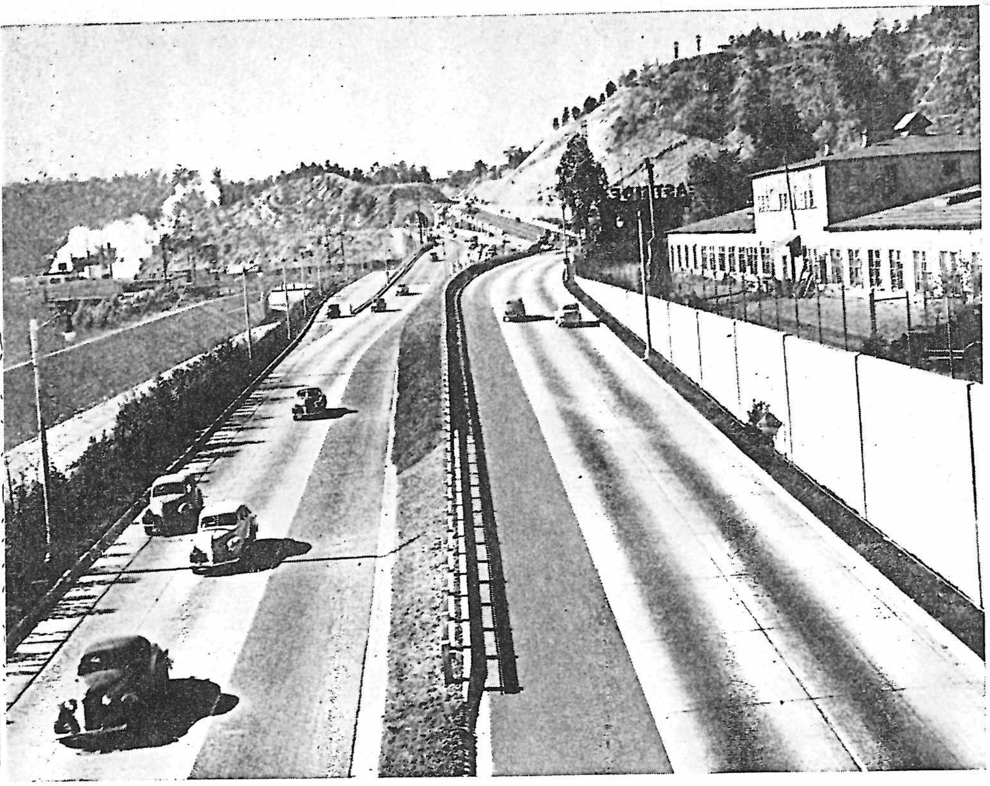
This work was completed to a degree that made it possible to open the south-

The newly completed Arroyo Seco Parkway Extension viaduct and bridge for southbound traffic only are shown at left of picture
Old viaduct and bridge over Los Angeles River for northbound traffic are seen at right





At top southbound traffic is approaching Los Angeles on new Arroyo Seco Extension and through open cut in Elysian Park, City Hall in background. Old road at left. Below—Southbound traffic passing under Park Row Bridge and Northbound through park tunnel



On the above section of Arroyo Seco Parkway opposing traffic proceeds on different levels separated by railing and planted slope

bound highway on December 31, 1943, thus giving the heavy New Year's day traffic the benefit of the Parkway from Adobe Street in Los Angeles to Glenarm Street in Pasadena. Certain items of work under the A. S. Vinnell Company and Engineers Limited contract are not yet completed, but except for the periods when it will be necessary to divert traffic from the southbound roadway while certain of this work is being done, the public is having the use of the Parkway.

Another small contract has just been awarded to Vido Kovacevich for work in completing an accelerating lane near Bernard Street and some channelizing for inlets at Castelar and Solano streets. Even after this contract is completed, there will remain the landscaping of the highway through Elysian Park and surfacing of certain city streets which were disrupted by the Highway construction.

However, this work is deferred for the duration as not being of sufficient urgency to justify its being completed during the war.

The opening of this section of the Parkway marks another step in the completion of a freeway from the heart of Los Angeles to Pasadena. The construction of such a road has been under discussion at various times since as far back as the 1890's and has been mentioned in each major traffic survey that was made of the Los Angeles District.

As early as 1922 the Los Angeles City Traffic Commission published a plan of major highways in Los Angeles which called for a roadway up the Arroyo Seco to Pasadena to be built as a double roadway, half on each side of the channel.

Although inviting the construction of a roadway by its freedom of expensive improvements along its banks the Seco presented a very real water hazard to any such highway project. In 1922, however, the cities of Los Angeles, and South Pasadena acquired a large part of the land which would be traversed by a Freeway in the Arroyo for park purposes.

At that time the State Highway Department was limited to the construction of highways outside of cities under bond issue funds. Later, with the advent of the gasoline tax and legislation liberalizing the highway policy, the State became actively interested in the construction of this freeway.

Still, the menace of flood water and the necessary heavy expenditure to protect against this menace was regarded a serious obstacle to construction of a highway along this location.

When the depression struck and it became necessary to find productive employment for a large number of men in the metropolitan area, the lining of the channel with concrete as a protection against flood waters in the Arroyo presented itself as a desirable project.

CHANNEL LINED BY WPA

Work on this lining was started by various relief agencies and was taken over by the WPA when that agency was formed and the lining of the channel from the south boundary of Pasadena to the Los Angeles River was completed by that agency with a Federal expenditure of $7,000,000, and an expenditure of $880,000 by four sponsors: the State Division of Highways and the cities of Pasadena, South Pasadena, and Los Angeles.

This expense, however, can not properly be chargeable entirely against the Parkway as the channel lining has also provided protection to park lands and private residence property.

With the flood waters adequately provided for, the construction of the highway presented no serious difficulties, and from its very inception has been marked by very complete cooperation by all of the agencies involved, which included the cities of Pasadena, South Pasadena, and Los Angeles, and the Federal agencies of the WPA, PWA, and PRA, with special mention being given to the Los Angeles Park Department which donated the necessary park land.

This cooperation has not been passive, but has been most active, each agency taking an active part in various portions of the highway planning and construction.

TOTAL COST $10,639,427

Without taking into consideration the original cost to the various cities of the park lands which were afterwards donated for highway purposes, the total cost of this improvement, including the purchase of rights of way outside the park lands, the moving of two railroads, sewers, the construction of four highway tunnels, etc., and one-half the cost of channel lining, is $10,639,427.

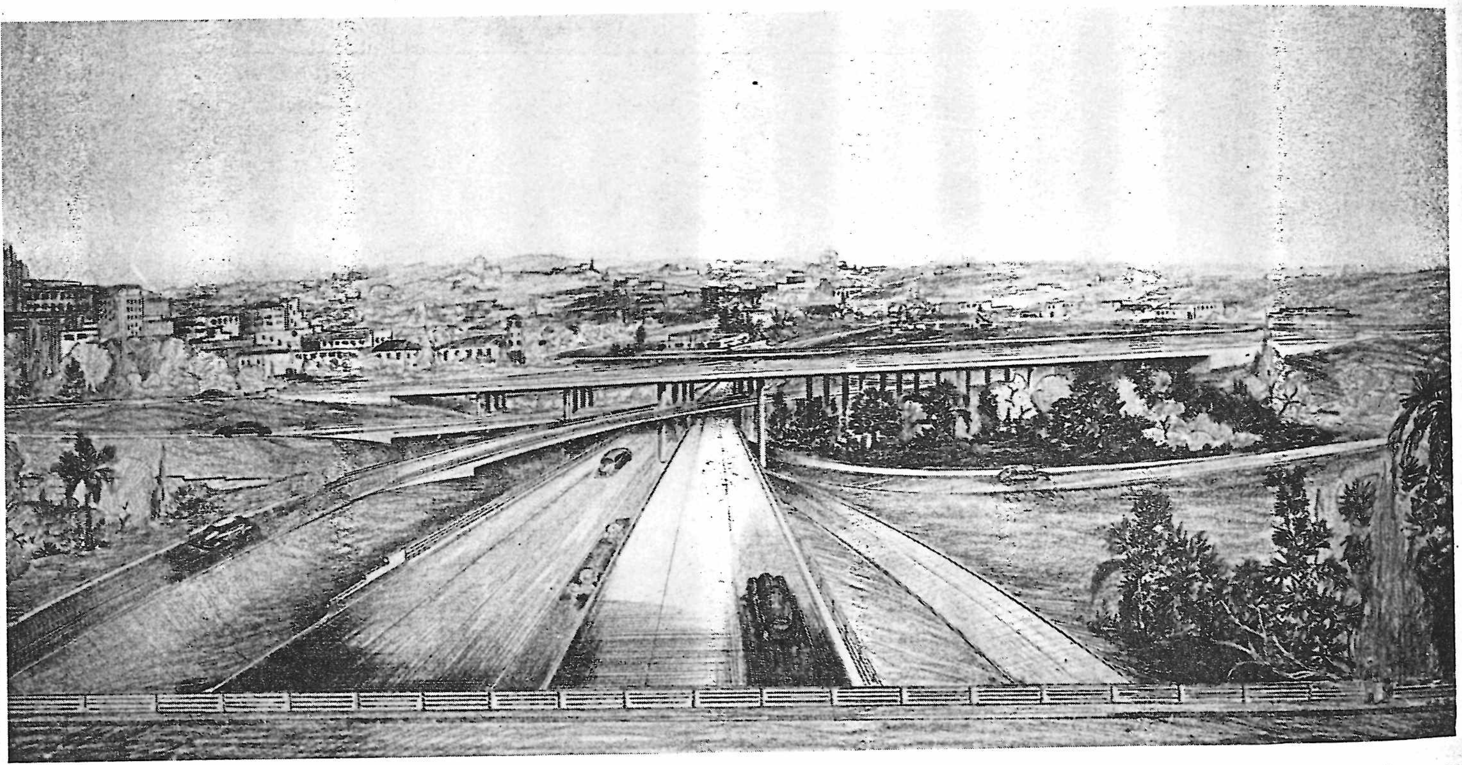
The length of the Parkway from Adobe Street in Los Angeles to Glenarm Street in Pasadena is practically nine miles. When it is remembered that a portion of the WPA expenditure must be considered as relief expenditure, the net cost of this Parkway would be less than one million dollars per mile.

Although the first true freeway to be constructed in California, this road is serving as a model for the design of other freeways.

Four Level Grade Separation for Los Angeles Parkways Intersection

By S. V. CORTELYOU, District Engineer

A PARKWAY system to serve the Los Angeles metropolitan area has been the subject of exhaustive study over a long period of time. The location has been definitely fixed for many of these major traffic arteries. The more important of the parkways are on the State highway system and are expected to handle interregional and through traffic as well as the local travel.



Artist's sketch of proposed 4-level grade separation in Los Angeles of State Highway 165, Arroyo Seco-Harbor Parkway, shown as the broad six-lane divided highway in center of picture and Route 2, Hollywood Parkway, crossing the picture at top level. The other roadways are traffic interchange connections with the two major arterials

In the development of plans and designs for parkways which will become a final responsibility on the State Division of Highways, this governmental agency has actively engaged for many months in studies of location and design, in cooperation with the Los Angeles City Engineering Department.

Two of the major routes in this category are State Highway Route 2 and State Highway Route 165 and it is the intersection of these two important traffic arteries which is the subject of this discussion and the site of the proposed four-level grade separation.

State Highway Route 2 is one of the most important major highways in California. It is a main thoroughfare from San Francisco to San Diego and traverses the heart of Los Angeles from Cahuenga Pass in Hollywood to the Los Angeles Civic Center at Spring Street. This portion has been designated as the Hollywood Parkway.

CONNECTS SANTA ANA PARKWAY

From the Civic Center southeasterly this route is known as the Santa Ana Parkway and continues past a junction with the Ramona Parkway to Santa Ana and the South Coast region. For about 20 miles this Parkway is located in extensively built-up areas subject to great local traffic movement as well as to heavy long distance travel.

State Highway Route 165 extends from Pasadena through Los Angeles to the Harbor at San Pedro. It is known as the Arroyo Seco Parkway from Pasadena to the intersection with the Hollywood Parkway, and as the Harbor Parkway from this point southerly to San Pedro. This route traverses about 25 miles of intensively improved areas and is the lateral roadway connection between the City of Los Angeles and large cities on either side.

This intersection of the Hollywood Parkway and the Arroyo Seco-Harbor Parkway at the westerly fringe of the Los Angeles Civic Center area will be the most intensely used interchange point on the entire parkway network, since two of the most heavily traveled routes cross each other at a point in close proximity to the center of business and governmental activity in the city.

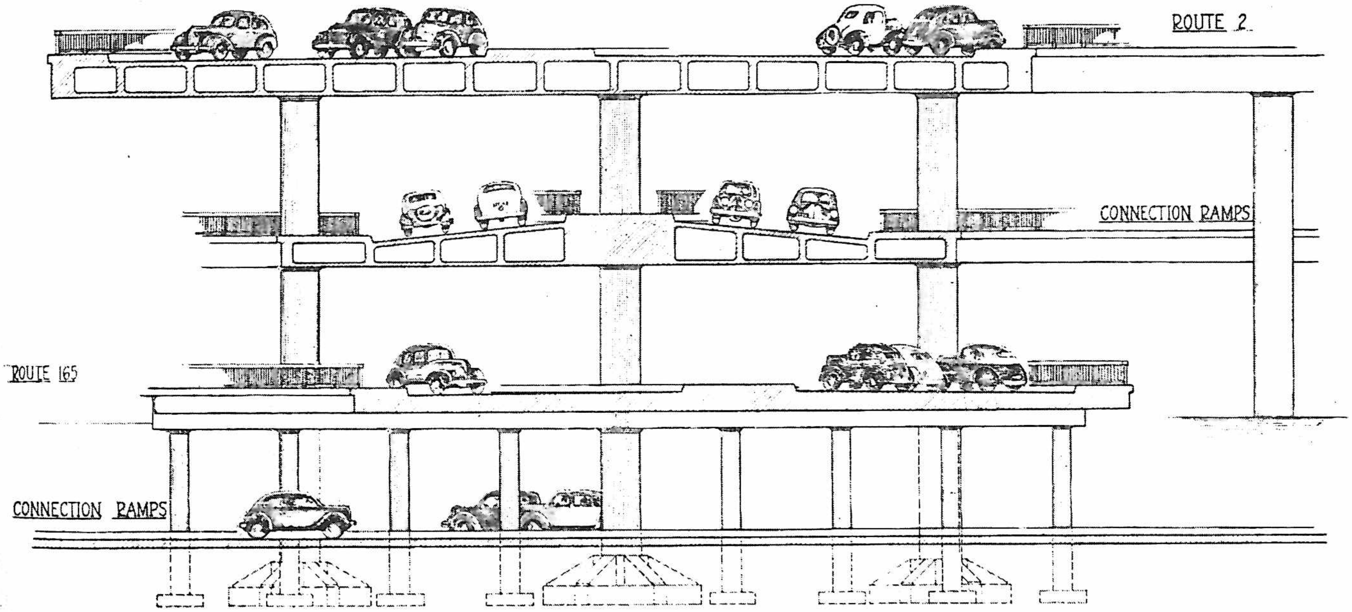
In recognition of the great significance of this interchange point, the engineers of both the city and the State have given special study to many forms of design in order to properly provide for the heavy exchange of traffic anticipated at the intersection.

State Division of Highways engineers have developed an entirely new type of grade separation and interchange system as an outgrowth of studies of the requirements at this site. This new interchange system has been designated as a "Four-level grade separation" and embodies unusual features designed to increase safety, to reduce traffic confusion, and to decrease travel distances for interchange traffic movements between Parkways.

The plan of the intersection clearly indicates that the method of handling exchange traffic between the two parkways is greatly simplified in comparison with the conventional types of interchange systems, as, for instance, the clover-leaf type in which the left turn is accomplished by means of a three-quarter of 270° loop to the right. In the clover-leaf type there is also an overlap of acceleration and deceleration traffic with resulting conflict and confusion. Other types of exchange systems employ reversing curvature and circuitous travel for some of the traffic movements, together with numerous bridge structures, all of which are detrimental to smooth and economical operation.

SIMPLIFIES TRAFFIC MOVEMENTS

The four-level grade separation eliminates these objectionable features by providing a simple turn for all traffic movements, in the direction in which each wishes to go and without excess distance over that which would be required in ordinary highway travel. It will be noted that the take-off from one parkway and junction with the other is in all cases made on the right side of the parkways, which is considered desirable on express type roadways.



Cross section sketch of 4-level structure showing traffic on two major highway routes and interchange ramp connections crossing at one point

In the four-level grade separation the basic feature is that the four separate roadway levels are so arranged as to pass one another at one point in a single bridge structure. The two major parkways intersect one another at approximately a right angle and on different levels, while two pairs of interchange roadways occupy a level each in positions bisecting the quadrants made by the main parkway crossing.

The lowest level is for the two 26-foot one-way roadways which handle the connections from the Harbor-Arroyo Seco Parkway to the Hollywood Parkway. The second level is the Harbor-Arroyo Seco Parkway which is a six-lane freeway with central dividing strip. The third level is for the two 26-foot one-way roadways handling exchange from the Hollywood Parkway to the Harbor-Arroyo Seco Parkway. The fourth or highest level is the Hollywood Parkway, a six-lane freeway with a 34-foot central dividing strip.

The resulting bridge structure is 69 feet in height from the lowest roadway to the highest roadway, of which about 47 feet will extend above the natural ground surface.

Advantage has been taken of the ground contours in working out the design. The lowest level will be depressed about 22 feet below natural ground surface, which is the limit to which it can be lowered and still obtain drainage by gravity flow to connect with the storm drain system. The second level, the Harbor-Arroyo Seco Parkway, will be at approximate ground surface. The third level is elevated in a manner similar to an ordinary overpass. The highest level, the Hollywood Parkway, is on a supported grade with a smooth profile which meets the higher ground on each side so that the resulting effect will be natural and pleasing.

Material for the approach fills is available from surplus excavation easterly on the Hollywood Parkway project, where the parkway is depressed for a considerable distance so that important city streets in the Civic

(Continued on page 17)

Four Level Highway Intersection for L. A.

(Continued from page 9)

Center region may remain at present grade.

Alignment standards are excellent on both parkways, being on tangent at the bridge site with easy curvature adjacent. On the connections the lowest level roadways are on tangent through the four-level structure with adjoining curvature radii of 350-450 feet, and 400-400 feet which will provide safe speeds on the interchange of 35 miles per hour or better.

The third level connecting roadways are both on 300-foot radius curves with safe speeds of 35 miles per hour. These curves would have had slightly longer radius except for an important obstruction in the form of a large school building where clearance is limited. While of shorter radius than the lowest level connection roadways, these curves are elevated and therefore have ample sight distance clearance.

Grade systems are good throughout, and meet requirements of design speed of 60 miles per hour on the parkways and 35 miles per hour at the interchange roadways. Near the bridge structure the Hollywood Parkway has a maximum grade of about 3 per cent, while on the Harbor-Arroyo Seco Parkway the maximum is a short stretch of 4.5 per cent grade. On the exchange roadways the grade varies.

The grade system demanded special care and study in its development largely on account of existing major streets on all sides of the four-level structure, which themselves required grade separations with the freeways and with the connecting roadways. These limitations made necessary a very careful adjustment of all grades and positions, since grade and alignment are interrelated and each affects the others.

It is proposed to construct the four-level bridge of reinforced concrete as this material will lend itself better to architectural treatment than would structural steel. The use of reinforced concrete will also be consistent with other nearby structures planned for the parkways. Reinforced concrete design requires a slightly higher overall structure due to the greater depth of girders and floor system which is required, but the small increase in total height is not considered objectionable.

The different levels of the bridge all show the influence of superelevation and the grade of the roadways which they carry or bridge, and in the final design these effects will be softened by proper architectural treatment of the soffit lines.

The structural design of the four-level bridge is based upon the use of nine main columns to carry the vertical loading which will be symmetrically placed and will extend from footing to the highest level, supporting the bridge decks of all levels except the lowest which is on the ground. The minimum vertical clearance for all roadways is held at 15 feet and horizontal clearance will be provided between curbs and columns.

It will be noted in the plan that the length of deck on the highest level bridge carrying the Hollywood Parkway obviates the necessity of using excessively high retaining walls. The use of retaining walls can not be entirely avoided but the design has been worked out so that there will be a minimum of wall and those required will not exceed 20 feet in height.

The area occupied by the site of the four-level bridge is an old district and buildings are out-moded and in many cases in disrepair. With the exception of the Custer School buildings, which are modern and which are preserved in the plan, there will be a benefit to the community by clearing out the old neighborhood and substituting a modern parkway facility which with proper landscape treatment will become a landmark of beauty and pride for the entire city.

The Hollywood Parkway from the Los Angeles Civic Center to a junction with the existing Cahuenga Park Freeway is regarded as an important freeway project in the Los Angeles metropolitan area. This unit will include the four-level grade separation and a portion of the Harbor Arroyo Seco Parkway. Postwar planning is proceeding at full speed.

The four-level grade separation which is believed to be a forward step in highway design is a development of an idea first suggested by District Location Engineer W. H. Irish. It is a design applicable to other sites, furnishing a compact, efficient and safe traffic exchange system, superior in many respects to most systems now in use, and at comparable cost where conditions justify this design.

Freeways End Congestion, Save Property Values

(Continued from page 14)

the adjacent highway. Limitation of access, still permitting the necessary highway contact, should cause no hardship nor be expensive. Agricultural use of adjacent land has the least detrimental effect on highway efficiency.

Acquisition of limited access while still providing reasonable access but confining the use of land to agriculture, will effectively protect the highway investment. It provides other benefits too: it protects the commercial establishments in the nearby urban areas; it prevents the wide, uneconomical spread of many small stores and shops.

BENEFITS CITY AND COUNTRY

It will help keep the city in the city and preserve the scenic values and the freedom of the countryside.

RENDERS SAFE, COMFORTABLE TRAFFIC

So, here too, in the country the freeway can advantageously fulfill its function: to render safe, comfortable, effective, unimpaired traffic service with economy.

It seems that we have really evolved a solution of our heavy-duty highway problem—a means of escaping from the hopeless, uneconomical dilemma into which we had fallen.

But as with everything that is of import to mankind—that is new—it is realized slowly. We must be discreet in applying this remedy. Vested property rights are still, next to human life, the most highly considered. If we push our freeway principle too urgently, we may have to pay high to establish it.

It is quite obvious that the most fertile field to produce benefits through the application of the freeway principle is in the city—in the high traffic density area. Even at the high cost we may encounter in establishing a freeway through a highly developed urban area, we are justified by the large benefits that soon become apparent.

Directly: Congestion is relieved; efficient, adequate traffic service is provided; hazard is reduced and safety increased; relief from driving strain and added comfort is found; time is saved and economy achieved.

Indirectly: Better living conditions are promoted; residential prop-

(Continued on page 20)

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Fort Moore Hill

Part of Historic Site Will Be Razed for Hollywood Freeway

By SPENCER V. CORTELYOU, Assistant State Highway Engineer

WHEN THE CONTRACT was awarded to Guy F. Atkinson Company of San Francisco on January 18, 1949, for the removal of the easterly portion of Fort Moore Hill in the Civic Center of the City of Los Angeles between Hill Street and Spring Street, an important step was taken in the Hollywood Freeway construction, representing the culmination of planning and negotiations of over ten years between the city, county and State.

This construction contract, figuratively and literally within the shadows of the United States Federal Building, the Los Angeles City Hall, and the Los Angeles County Hall of Justice, provides not only for the excavation and removal of a portion of Fort Moore Hill but also for the demolition of the existing tunnel on Broadway that is now used for pedestrian and vehicular traffic as well as for the double-track streetcar line of the Los Angeles Transit Company.

The contract also includes the excavation that is necessary for the portion of the Hollywood Freeway under Broadway, the construction of new pavement on Broadway from Temple Street to Sunset Boulevard, and the construction of bridges to carry Broadway over the freeway and over the inlet ramp to be provided so that traffic on Broadway can have access to the freeway for traveling to Hollywood and San Fernando Valley.

Cooperative Project

Although the contract is being handled by the State Division of Highways, it is a cooperative contract providing for work that will benefit the County of Los Angeles and the City of Los Angeles in the development of the ultimate plans for the Los Angeles Civic Center. The existing tunnel on Broadway and Fort Moore Hill has been a great obstacle in the path of the Hollywood Freeway and the civic center development.

The Los Angeles Civic Center Authority is the official coordinating agency of the city and county, having responsibility for developing the ultimate plan of the civic center. This authority has been instrumental and most helpful in working out the many administrative details so that part of Fort Moore Hill could be razed, the Broadway Tunnel demolished, and the grading for the Hollywood Freeway carried out all in one construction contract under general state supervision.

Prior to this contract, a three-party agreement involving exchange of properties and removal of buildings from the site, also provided that the State pay for that portion of grading, Broadway Tunnel removal, and new bridge structure, within the freeway, with the city and county sharing equally in the grading and tunnel removal in the remaining Fort Moore Hill area, and the city paying for the cost of constructing relocated Broadway.

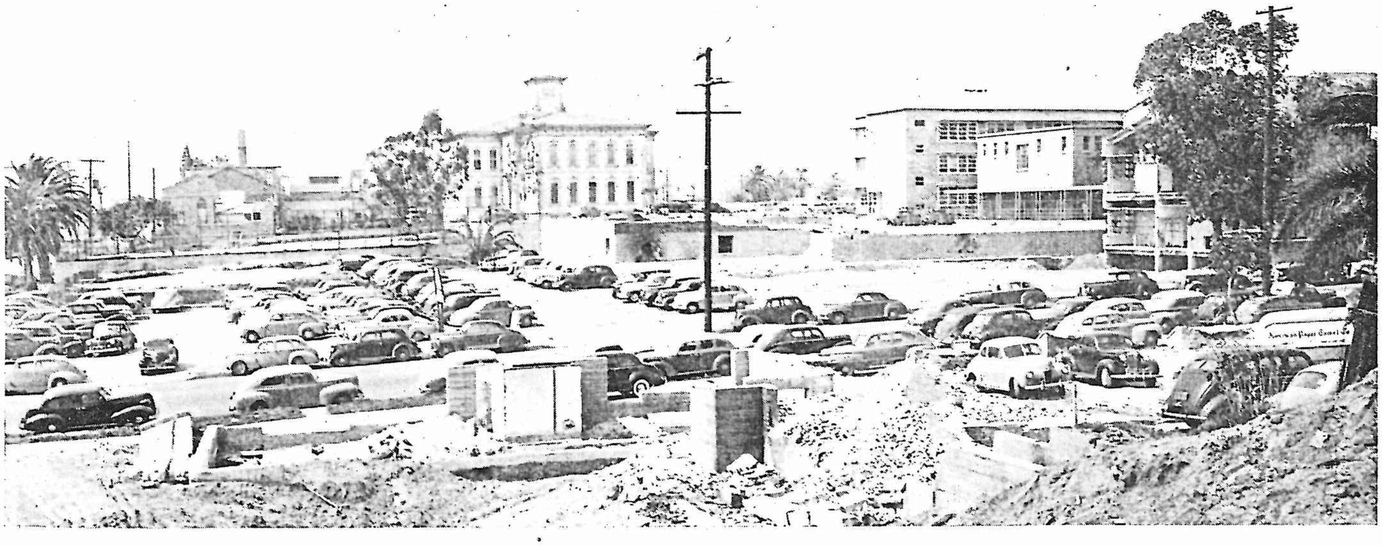
This resulted in an approximate participation in construction cost of tne present contract, as follows:

County	$156,000
City	248,000
State	530,000
Total cost	$934,000

Site of Pioneer Fort

The old Fort Moore Hill had an important place in the early history of the City of Los Angeles. Fort Moore was named in honor of Capt. Benjamin D. Moore of the First United States Dragoons, who was killed by a lance

View looking westerly from site of Fort Moore Hill. The street shown is the present Hill Street. The two-story building with cupola is the historic old Los Angeles High School, which, with other buildings beyond, has to be moved



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thrust in the bloody battle of San Pascual in 1846. Fort Moore was laid out by Lieut. William H. Emory of General Kearny's staff. It was planned for a garrison of 100 men and was to have a breastwork 400 feet long with a bastion for six cannon in barbette.

The work on the fort was commenced in April, 1847, by sailors and marines commanded by Commodore Stockton. Differences between the commodore and General Kearny interrupted the work for a time. It was continued by a Mormon battalion under Lieut. Col. John C. Fremont, and though not completed, the fort was dedicated on July 4, 1847. The flag was raised on a pole 150 feet high, made from two pine trees brought from the San Bernardino Mountains by a crew of native Californians and Indians. The original flagpole must have been considerably taller than the present existing flagpole above the south portal of the Broadway Tunnel, as shown in the accompanying photograph, because the existing flagpole is only 80 feet high.

After Fort Moore was abandoned as a military establishment, the hill became the site of the town gallows, and dozens of outlaws and cutthroats were hanged there.

Later, the hill became the choicest residential section of the city. The Banning residence and stable were still standing when work was started on this project. According to some old residents, the Banning home was reputed to be the old officers' quarters and the stable was a station on the pony express system.

Heavy Excavation

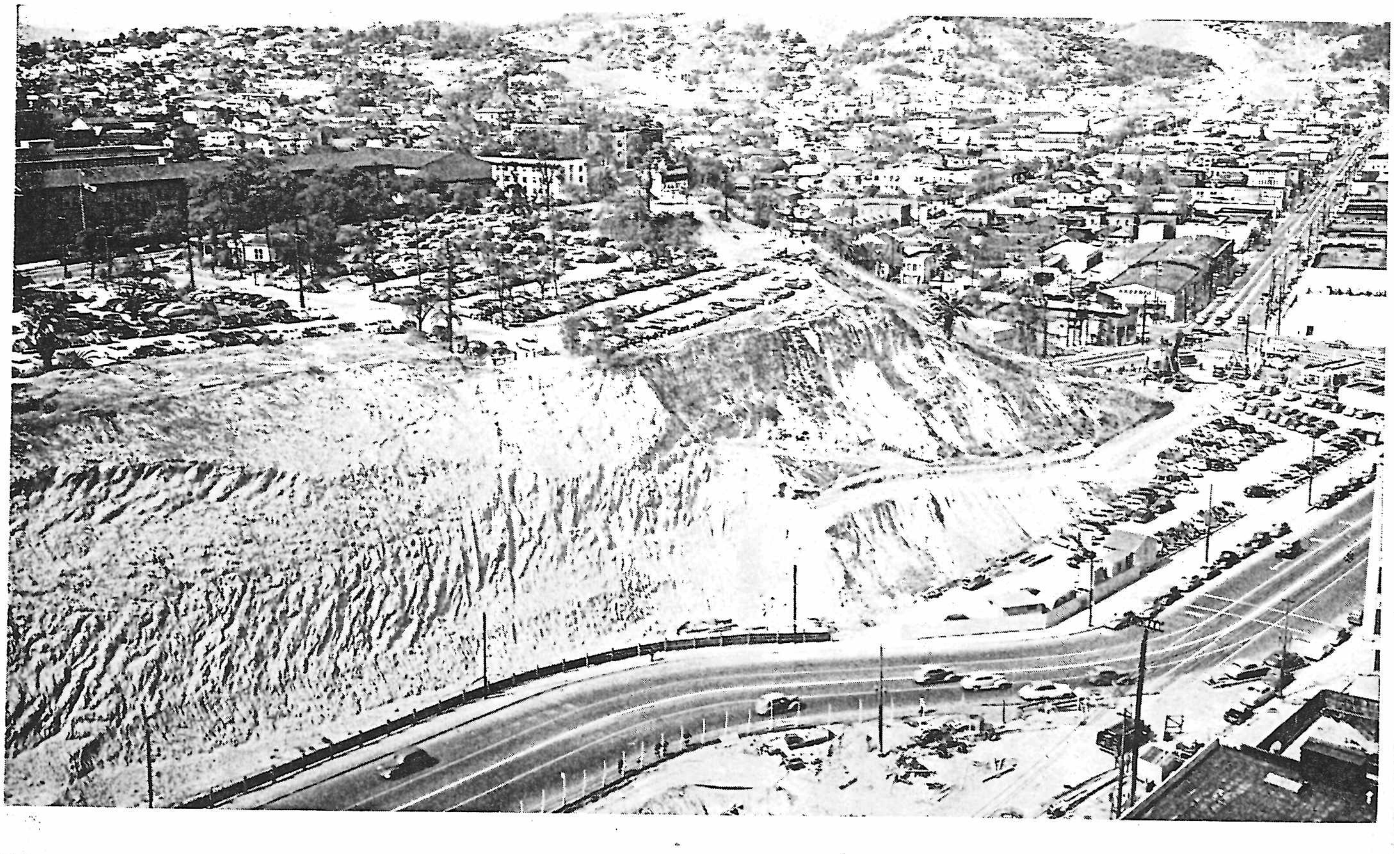
The construction work under the Atkinson Company contract will involve the removal to the Bishops Road disposal area of approximately 900,000 cubic yards of roadway excavation. The upper 27 feet is a granular material which will be stockpiled for later use as subbase material in the construction of the freeway. Under this granular material the soft shale rock will be excavated to a depth of 75 to 90 feet. This rock lies in thin strata which are almost vertical with the tilt from south to north being about 20 degrees. The tunnel to be removed is 765 feet long; the inside width is 40 feet, the clear height is 23 feet.

All streets in the downtown area of the City of Los Angeles carry such a large volume of traffic every day that none of them can be completely closed for construction operations. As the photographs show, a detour has been built to carry the Spring Street traffic around the grade separation bridge now under construction that is to carry Spring Street over the freeway.

Broadway Tunnel Removal

The removal of the Broadway Tunnel would have been too hazardous to carry out while traffic was using it. Therefore, after excavating about 200,000 cubic yards easterly of the tunnel, a detour road 40 feet wide will be built about 125 feet east of the tunnel, and the streetcars and automobiles will be rerouted thereon. This detour will be paved with four inches of plant-mixed

North end of Fort Moore Hill. Barricade erected by contractor along Spring Street detour to catch falling rock and dirt is shown in left foreground. Right center shows resident engineer's office, contractor's offices, construction yard and county parking ground



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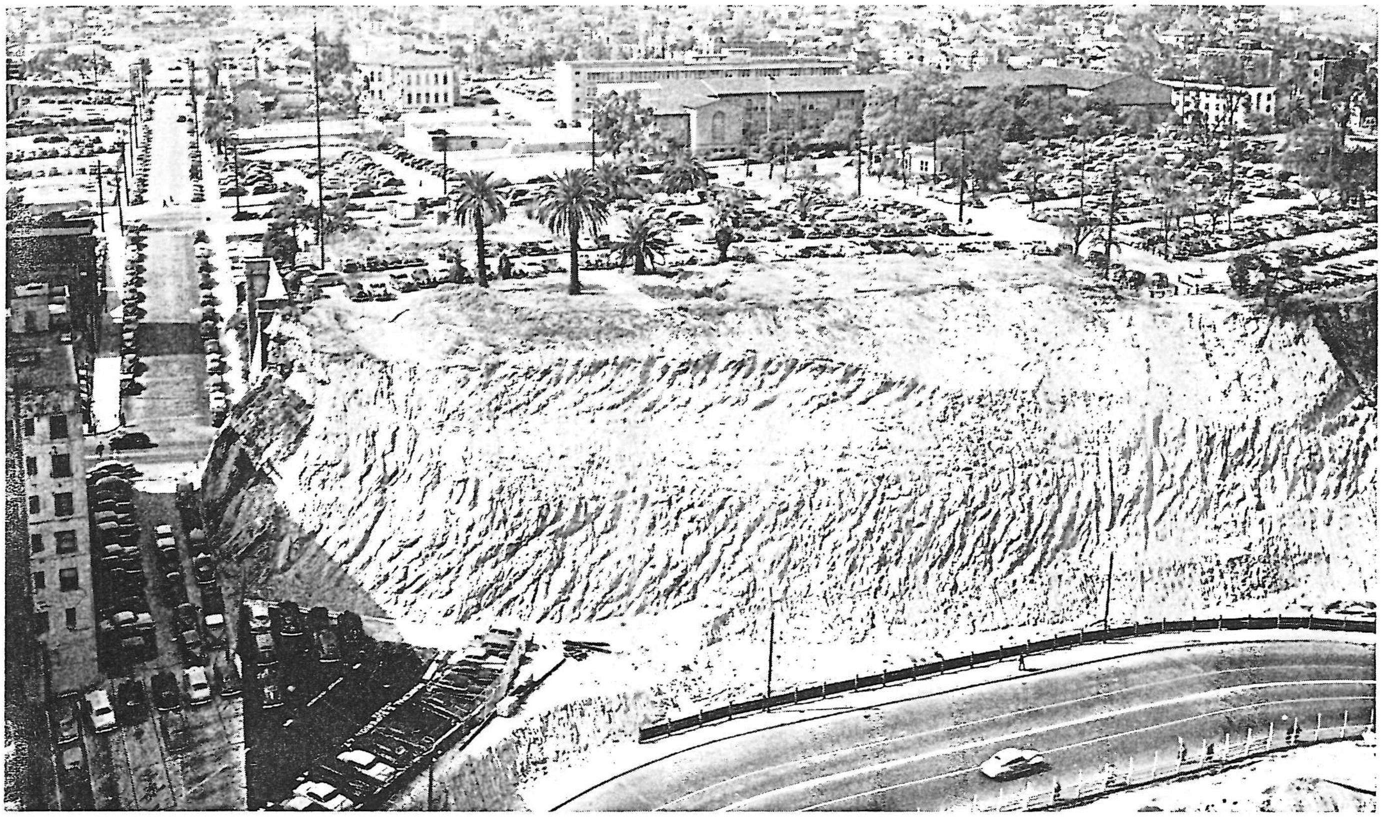
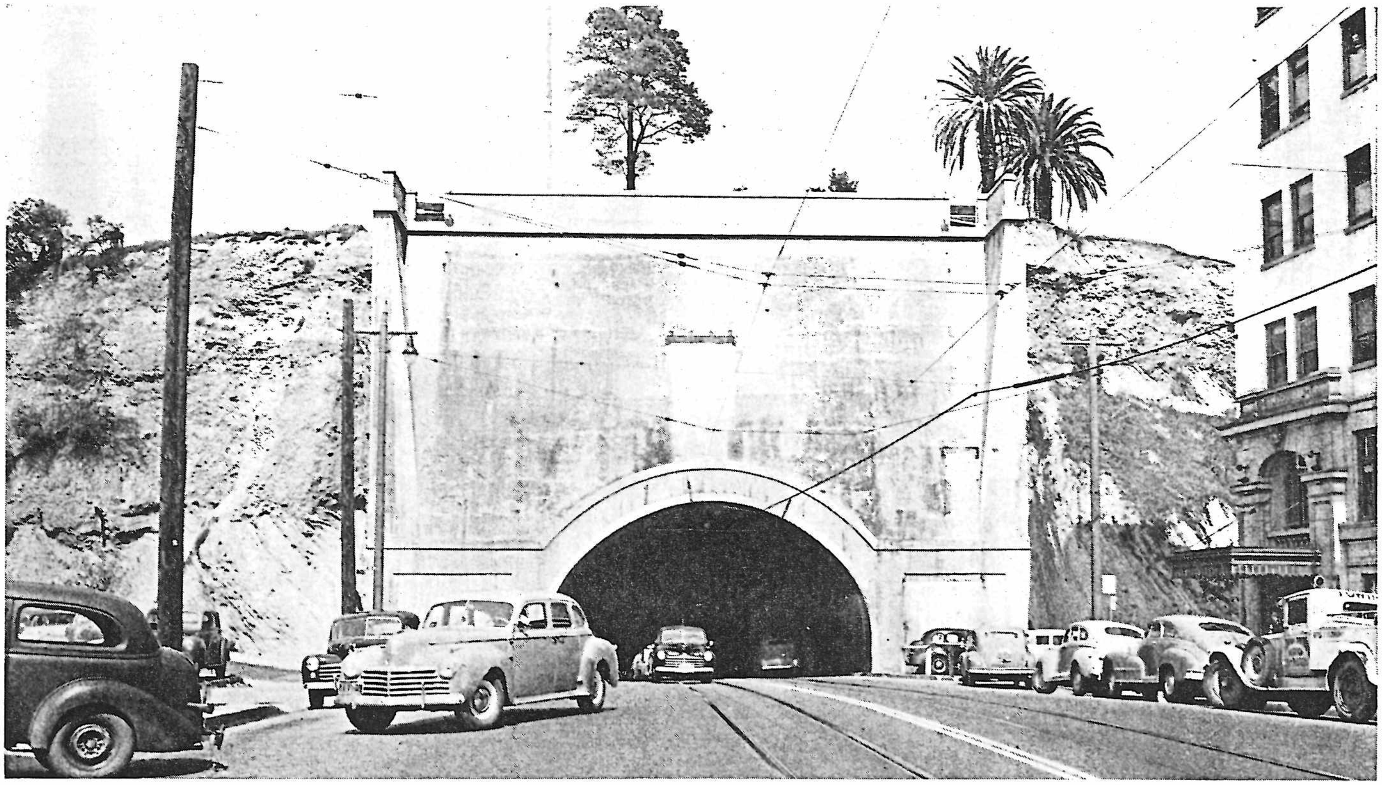
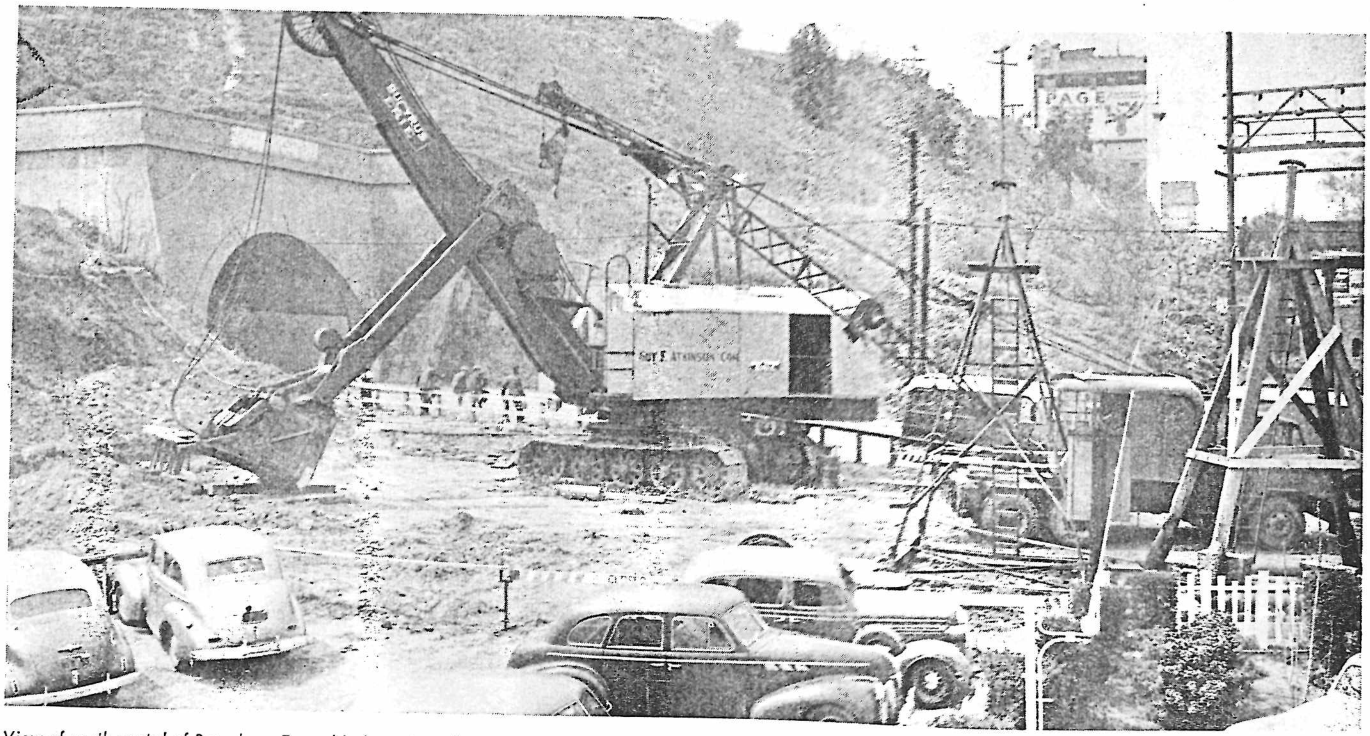


This portion of Moore Hill will be removed. Spring Street detour in foreground. California Street on left. Hollywood Freeway will go through to the right of California Street. South portal of Broadway Tunnel can be seen left center

South portal of Broadway Tunnel that is to be entirely removed. Broadway detour will take off to the right of tunnel and will require the removal of a portion of the portal prior to the tunnel removal





View of north portal of Broadway Tunnel before start of excavation operations. The contractor's shovel is an electrically operated rig weighing 185 tons, supplied with a 2300-volt current. Capacity of the dipper is six cubic yards

surfacing laid on the best of the granular material from the cut.

Because the present structural strength of the Broadway Tunnel might not be sufficient to carry eccentric loadings, the cut slope for the detour is being carried down at a distance of 30 feet from the tunnel. The new Broadway pavement will have a clear width of 60 feet between standard curbs. The center strip of 19 feet to provide for the double-track streetcar line of the Los Angeles Transit Company will be paved with five inches of portland cement concrete laid on the ballast and surfaced with two inches of asphalt concrete. On each side of this strip will be a 13.5-foot lane paved with eight inches of asphalt concrete laid on a one-foot course of untreated rock base. Outside of these lanes will be a parking lane seven feet wide of eight-inch portland cement concrete laid on one foot of untreated rock base.

Excavating Equipment

The contractor's heavy excavating equipment is unique within a large city downtown business area, and was chosen to permit the excavation and old tunnel removal to progress in a continuous operation. This was considered to be both the safest and most expeditious manner of carrying out this work, which could not be accomplished by the use of smaller equipment.

The original Broadway Tunnel was constructed in 1900 by the City of Los Angeles. The grade of this tunnel was appreciably lowered, and the tunnel reconstructed in 1910, leaving in place the arched sides and roof of the original tunnel. Both of these were of brick masonry, but the present bore visible to those traveling through the tunnel does not indicate the large cross-section of the double-tunnel removal confronting the contractor. The six-yard Bucyrus-Erie electric shovel, weighing some 185 tons, is supplied by a 2,300-volt current from a substation erected by the Department of Power and Light of the City of Los Angeles.

Night Operations

Present operations are confined to the excavation of the rather narrow strip required for the temporary detour for Broadway east of the existing tunnel. Hence, maximum production of this large shovel has not yet been realized since these confined operations permit loading only on one side with a three-fourths swing of the shovel. Approximately 4,500 cubic yards is being presently excavated per shift. To avoid hauling through the heavy daytime traffic, the working hours are from 7 p.m. to 6 a.m. The brilliant banks of floodlights, and the numerous lights on the shovel and on the trucks, and the smooth, almost noiseless, and seemingly effortless operation of the shovel, form an entrancing and spectacular nighttime picture.

It is estimated that this construction contract will be completed during the summer of 1950. The work is being carried out under the general supervision of District Engineer W. L. Fahey and Assistant District Engineer Frank B. Cressy. The resident engineer is Ray A. Collins. The superintendent for the contractor, Guy F. Atkinson Company, is E. M. Raimer.

Hollywood freeway design outlined on aerial photo on the opposite page shows the route of the Hollywood Parkway from its connection with the Santa Ana Freeway at Spring Street. The first building in lower left is the Federal Building and beyond it the Los Angeles County Hall of Records. The small building between Hill Street and Grand Avenue to the right of the Parkway is the old Los Angeles High School building, which is to be moved. Beyond it are the Grand Avenue grade separation and Figueroa Street bridges

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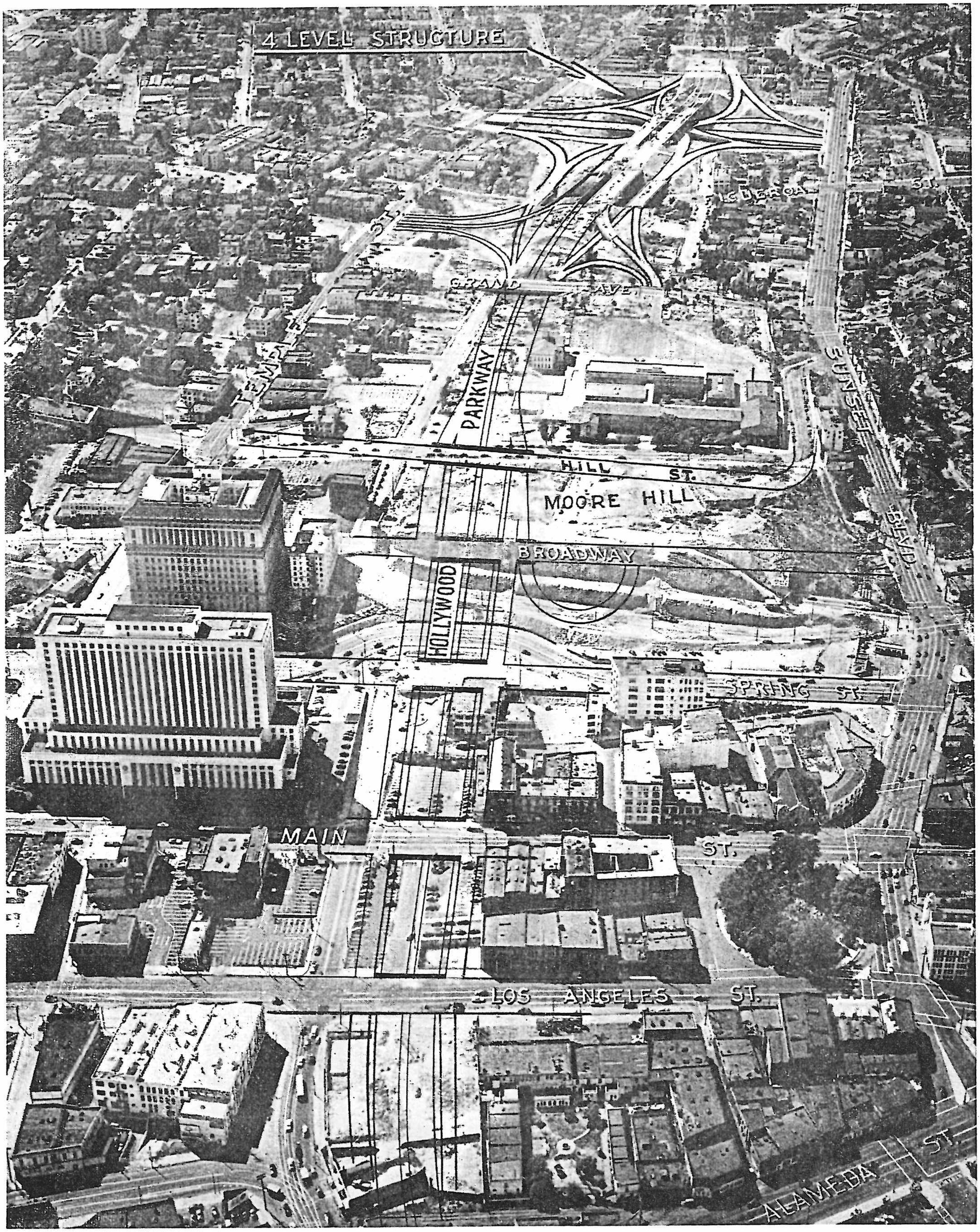


Santa Ana Freeway

Another Unit Is Opened to Traffic

By PAUL O. HARDING, District Engineer

WITHOUT FANFARE or formalities of any kind, the barricades were removed on the morning of April 4, 1949, and public traffic was permitted to move over the newly completed extension of the Santa Ana Freeway from Soto Street in the City of Los Angeles southeasterly to Eastman Avenue. Added to the section from the Aliso Street crossing of the Los Angeles River to Soto Street that was opened to traffic about eighteen months ago, there is now a total of almost four miles of completed Santa Ana Freeway extending for one-half mile beyond the easterly Los Angeles city limits.

The Santa Ana Freeway is one of the most important of the freeways that have been established to serve Southern California areas. It is in effect an easterly extension of the Hollywood Freeway. It extends from the Los Angeles Civic Center in a general southeasterly direction through Los Angeles County and Orange County area to the City of Santa Ana.

The fact that the Santa Ana Freeway follows a northwesterly-southeasterly direction makes it of particular strategic value because so many of the important existing traffic arteries of this portion of the State have been laid out in a general northerly and southerly or easterly and westerly direction.

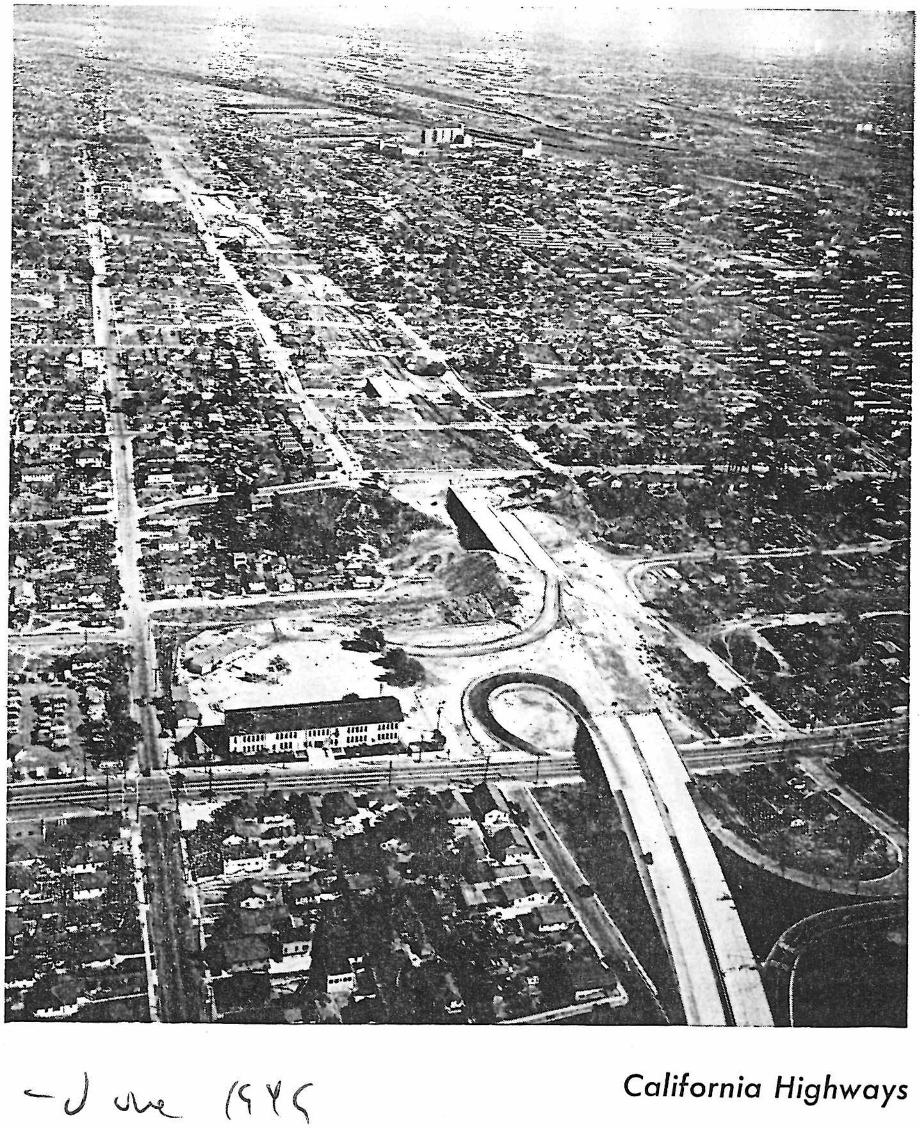
Fourteen Grade Separations

On the completed section there are 14 grade separation bridges, providing overpasses and underpasses. The construction schedule called for 17 separate contracts. The first contract to be let was for the construction of the Fourth Street grade separation bridge to carry the freeway under Fourth Street. This contract was awarded on January 5, 1946, and construction has been under way on various phases of the work continuously since that time.

The Santa Ana Freeway is a six-lane freeway with the width of the central dividing strip being 10-foot minimum and 34-foot maximum. The traffic lanes are 12 feet wide. The pavement on the main traffic lanes of the freeway is eight inches thick, Class "B" Portland cement concrete, laid upon cement-treated subgrade and selected subgrade material. To provide color differentiation, the pavement for the interchange roadways is six inches of Class "B" Portland cement concrete base, topped by two inches of asphalt concrete surfacing.

The recently completed construction between Soto Street and Eastman Avenue included grading, paving, and the miscellaneous work that was necessary to connect up and make usable the previously completed grade separation overpasses and underpasses that had been built under prior contracts. The Griffith Company, contractor for this grading and paving work, completed this important freeway unit a

Aerial photograph, taken one year ago, looking easterly from completed section of Santa Ana Freeway at Soto Street to Eastman Avenue, showing completed grade separation and right of way cleared and ready for roadway construction



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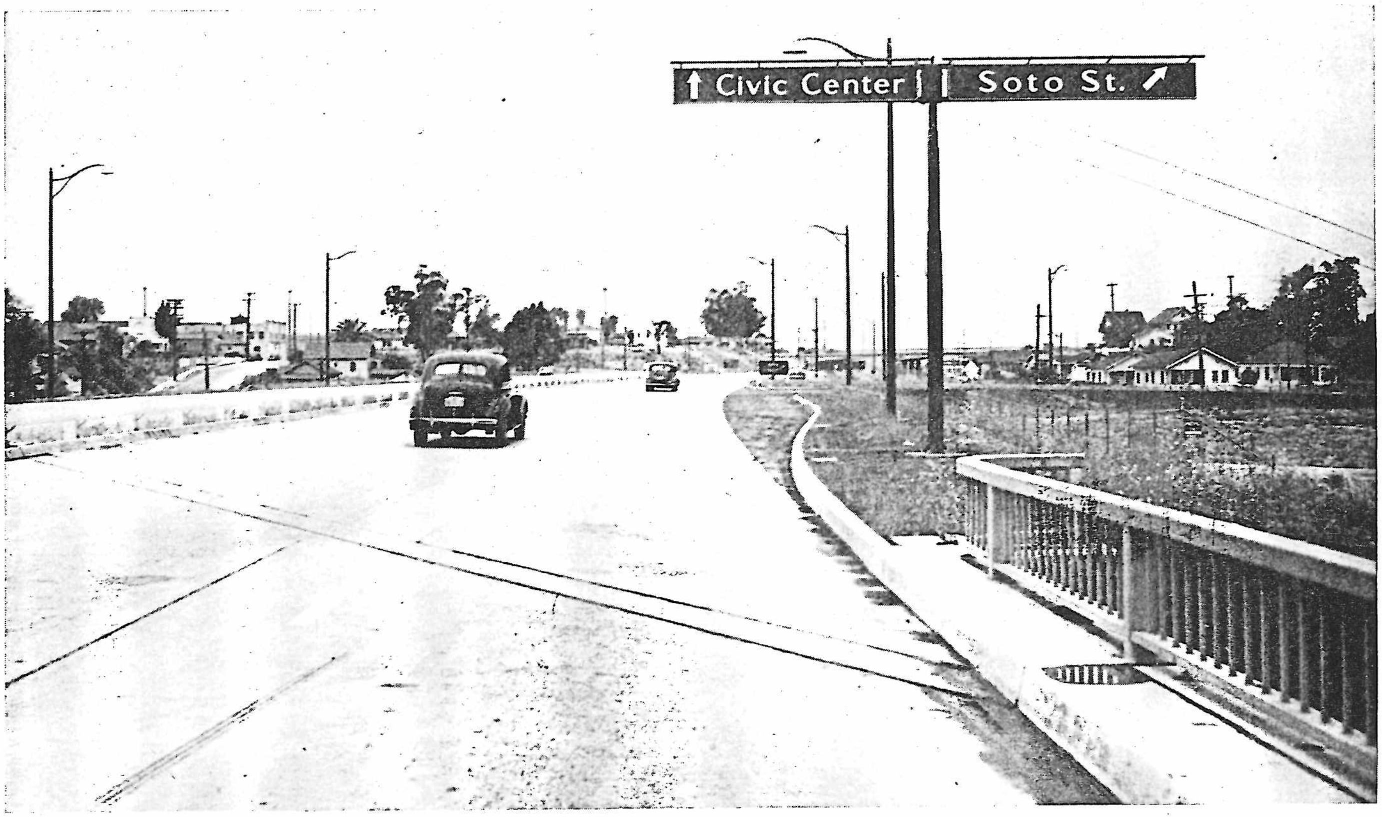
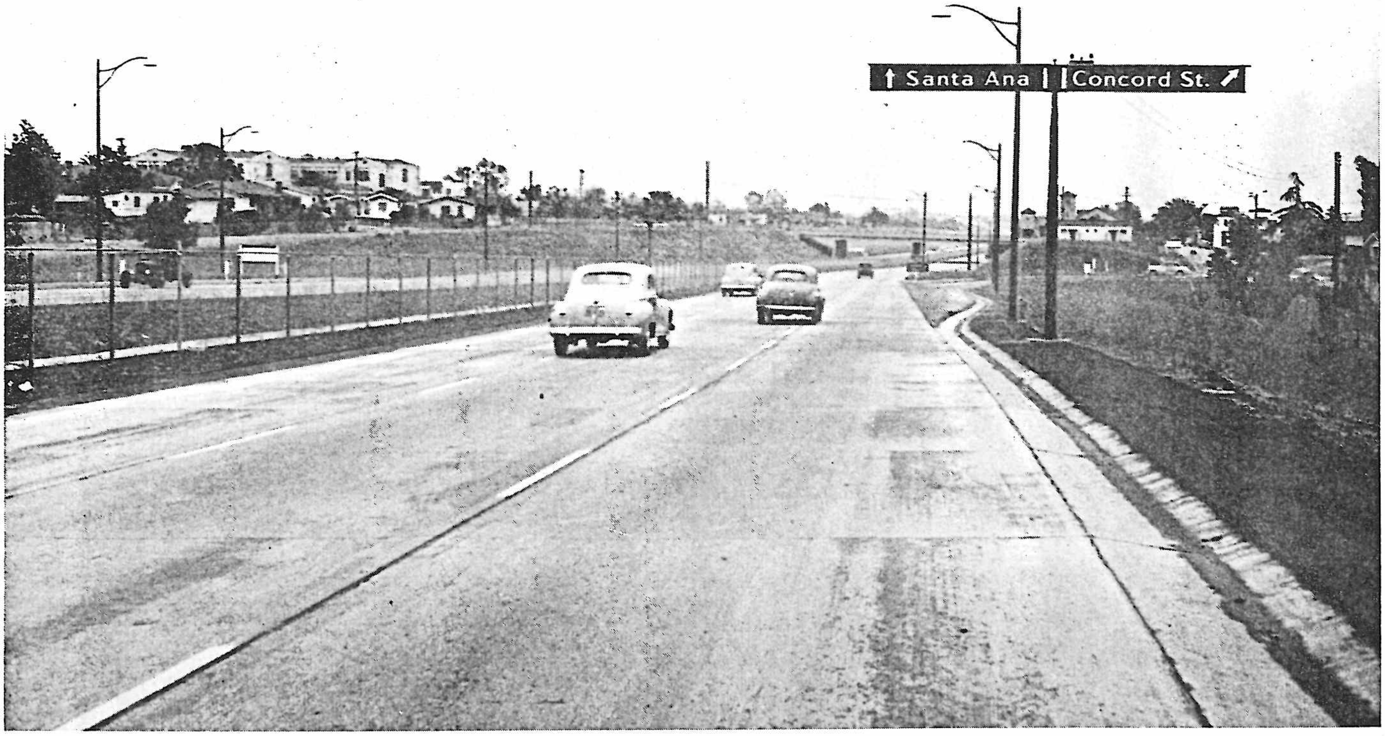


UPPER—View westerly along Santa Ana Freeway from Olympic Freeway grade separation bridge. LOWER—View easterly along the Santa Ana Freeway from near Grande Vista Street, showing Lorena Street grade separation bridge



full two weeks ahead of the official time limit for the contract.

Many New Features

Construction operations on this contract were described in an article by Resident Engineer B. N. Frykland in the September-October, 1948, issue of *California Highways and Public Works*, and a second article by Assistant Resident Engineer W. V. Brady in the March-April, 1949, issue. Many unusual features of construction procedure and methods of embankment compaction and cement treatment of subgrade were described in these two illustrated articles.

Many new features have been provided for the convenience and safety of public traffic using this freeway. Long lengths of rolled gutter and curb with five feet wide shoulders paved with three-inch thicknesses of plant-mixed surfacing have been constructed so that vehicles needing to make emergency stops will have ample opportunity to drive off the main traffic lanes and out of the way of the fast moving freeway traffic.

New Directional Signs

In addition to the customary reflectorized warning and directional signs with white eight-inch high lettering on a black background. directional signs of a new type have been installed. For increased legibility, lower case letters are used on these special signs that are placed at the turn-off locations, and the signs are placed high above the driver's eye so as to be visible from a considerable distance.

By experiment it has been indicated that signs utilizing lower case lettering can be understood more readily than signs that are all in capital letters. This is contrary to a general prevailing belief that legibility is increased by the use of capital letters. It is anticipated that there will be an increased use of signs with lower case lettering as soon as the effectiveness in practical use has been more conclusively proven.

For ease in reading the directional signs at night, a special type of fluorescent lighting has been provided by means of small diameter tubes which give more effective illumination. These fluorescent tubes are known by the trade name "Slimline."

At all on and off interchange roadway connections, adequate lighting has been provided. The steel lighting standards place the luminaires 30 feet above the pavement. The lights are special type 10,000- and 15,000-lumen lamps with a highly refractive type of glass cover so that increased intensity of light is obtained at those points where the driver needs to have good night-time visibility.

The accompanying photographs show sections of the two-mile unit of the Santa Ana Freeway construction that has recently been completed and opened to traffic.

State highway construction contracts on the freeway have been completed as follows:

Description	Contractor	Construction cost
Road Construction, Kearney St. to Soto St.	Peter Kiewit Sons' Co.	$1,374,000
Seventh St., Grade Separation	Byerts & Dunn	239,800
Lorena St., Grade Separation	W. J. Disteli	147,800
Storm Drain and Sewers, Soto St. to Indiana St.	Mike Radich & Co.	416,500
Fourth St., Grade Separation	Byerts & Dunn	145,200
First St., Grade Separation	J. E. Haddock	183,000
Aliso St., Ramp 4 Bridges	Contracting Engrs. Co.	132,100
Boyle Ave., Grade Separation	Peter Kiewit Sons' Co.	202,600
Landscaping, Kearney St. to Soto St.	Jannoch Nurseries	79,700
Olympic Parkway, Grade Separation	J. E. Haddock	332,900
Esperanza St. and Indiana St., Grade Separations	J. E. Haddock	272,100
Soto St., Grade Separation	Oberg Bros.	205,800
Euclid St. and Marietta St., Grade Separations	Spencer Webb	265,000
Road Construction, Aliso St. to Kearney St.	Vido Kovacevich Co.	235,500
Landscaping, Aliso St. to Kearney St.	Jannoch Nurseries	11,300
Road Construction, Soto St. to Eastman Ave.	Griffith Co.	1,052,700
Highway Lighting	Electric & Machinery Service Co.	118,000
Total		$5,414,000

Huge Job

Continued from page 41 . . .

Ramona Freeway:	Los Angeles to Pomona. We look with confidence to ultimate construction along the Ramona Freeway from Indiana Street to the east city limits of Los Angeles, easterly to Rosemead Boulevard. Practically all building improvements have been removed from the right of way area easterly from Indiana Street to the west city limits of Alhambra. Through the south portion of the City of Alhambra over 50 percent of the buildings have been relocated; all of the remaining 50 percent of the residence buildings are of such age and condition that they can be relocated and rehabilitated and fortunately there are ample vacant lots in the immediate vicinity of the present location of the buildings to assure their relocation and rehabilitation. Extending easterly from the east city limits of Alhambra to Rosemead Boulevard very few residential buildings will be affected, and all are capable of being relocated within a maximum distance of a block or two where vacant lots are available.
Arroyo Seco Parkway:	73 families, consisting of 293 people, moved and rehabilitated.

Optimistic of Future

As we in the Right of Way Department look forward to the huge job ahead in clearing right of way for the Harbor Parkway extending southerly from Olympic Boulevard to the harbor, the East By-pass and other freeway projects that are bound to follow, we realize that the worst of our job is over. The housing shortage in the metropolitan area of Los Angeles is slowly but surely easing, but the strongest contributing factor to our optimism is the fact that in these areas there are few, if any, residence buildings that cannot be relocated and rehabilitated on new lots within close proximity of their present location.

It is anticipated, because of the easing of the housing shortage in the Los Angeles area, that within the very near future the program of selling buildings "tenant occupied" can be discontinued and all residential building improvements can be sold at public auction in the usual manner free of tenants. In this connection it is pointed out that all auction sales are conducted in public after ample publicity and postal card notice to all persons or firms who have requested that their names be carried on our mailing list; it follows that the tenant living in the building to be sold has his fair chance in common with the public generally to purchase the building.

. . . Continued on page 64